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The Commodore 64C

Report From The Summer
Consumer Electronics Show

Tightrope

A Thrilling Action Game
For Commodore 64, 128,
Atari, Apple, Amiga,
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For Atari ST

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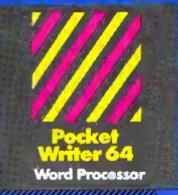
A New IF/THEN
For Atari BASIC

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For Apple II Disks

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With IBM BASIC

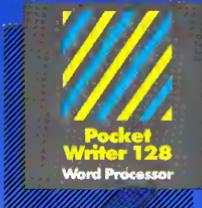


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Editor's Notes

The recent Summer Consumer Electronics Show was both interesting and disappointing. Last year at this time, the industry was reeling from a tremendous downturn in sales growth, and the resulting shakeout had otherwise stable vendors describing those times as the end of the entire personal computer industry. A year later, we're still here, and the doom and gloom forecasters have retrenched. We're a wiser, more mature, and perhaps more stable industry, and the attitude among the exhibitors at the show was much more upbeat. We heard talk of steadily improving sales, enthusiasm for new products, and a better holiday season on the horizon. We also heard a general level of enthusiasm for the hard-charging Atari Corporation, and a more specific level of disappointment at the Commodore showing. Atari had a large and impressive booth, impressive in that it contained dozens of smaller exhibits where independent vendors demonstrated software for the ST series. Visitors thus immediately encountered a tremendous amount of activity encompassed in a group of highly supportive people.

The Commodore appearance evoked a mixture of concern and amazement. Remember, we're talking about a company here with an active, enthusiastic installed base of literally millions of computers. We're talking about a computer series called the 64 that just keeps going, the 128 with a success record that we suspect even impresses Commodore, and the

Amiga. One of the most technologically superior computers on the market, the Amiga continues to suffer at the hands of the superior marketing attack of the Atari-led Tramiels.

Commodore continues to insist that the Amiga is a business machine. One must assume that this is the reason none was present at CES. In the Commodore suite, only 64s and 128s were visible. It was simply amazing. And very quiet when we were there. The seeming lethargy in market positioning that has stricken Commodore since the introduction of the Amiga is one of the most shocking turnabouts we've witnessed in the modern history of this industry. One wonders whether the bankers have begun to call the strategic shots at Commodore.

We think that it is important to this industry as a whole that Commodore is, and continues to be, a viable player. Do not misunderstand. We saw nothing at CES that says it is not a viable company. We simply question the wisdom of its continued refusal to open up the Amiga market. Obviously such a decision is Commodore's, not ours, and obviously we're on the outside, but one can only marvel at the continued growth and success of Atari and the relative demise of the Amiga.

Last summer this time, both the ST and the Amiga were launched from an installed base of zero. Now, as we conclude the first year of product delivery, we find the ST with an installed base of roughly ten times

that of the Amiga. Not a very stirring record. During this one-year period, the ST has grown, evolved, expanded to include the 1040, undergone in Tramiel-like fashion a predictable series of aggressive price cuts, expanded marketing outlets, etc. We've seen it all happen before with the VIC and the 64, but it's still quite impressive when it works.

Contrast with this the concurrent introduction of the Amiga. It was categorized, or defined, as a business machine. Its prices have changed only minimally. It has, to put it politely, withered. As we said, we think this industry needs Commodore, and it needs the vision and direction that a Commodore can help provide. We do not want it to be too late. Maybe if you gentlemen and ladies would just nudge the Amiga a little bit toward the consumer market, you'd be pleasantly surprised. Perhaps a price cut here, a market incursion there. You get the picture. You've got millions of users out here looking to you for technological leadership. Thanks. ©



Robert C. Lock
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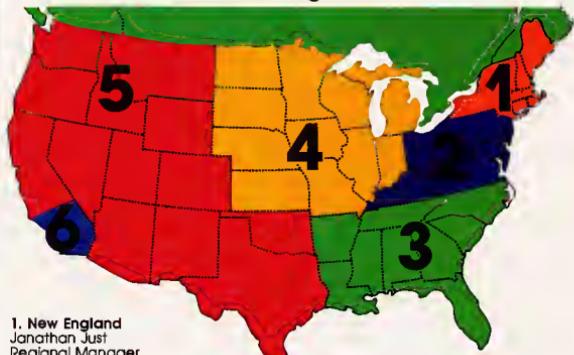
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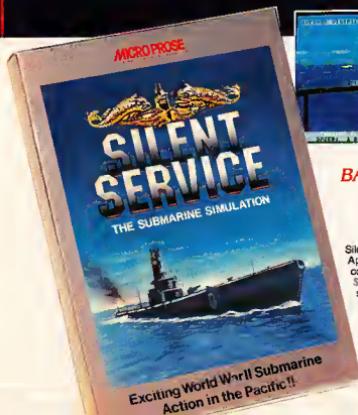
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Assemblers And Monitors

I am a little confused about the difference between an assembler and a machine language monitor. Would you please explain the functions of each?

Adam C. Stuart

Simply put, an assembler is a program designed for one specific purpose—helping you write machine language programs. A monitor can be used for that purpose, too, but can also perform other memory-management tasks. Most programmers use an assembler for writing long ML programs and a monitor for writing short, experimental routines or debugging the code produced by an assembler.

To illustrate the difference, let's say that you have a short machine language program beginning at location 49152 (\$C000) on the Commodore 64. A monitor allows you to examine the contents of any memory location. If you type M C000 C00C from the monitor, the following display might appear:

```
:C000 A9 42 20 06 C0 60 20 D2
:C008 FF 20 D2 FF 60 00 00 00
```

This memory display, like other monitor output, is in hexadecimal (base 16) notation. The numbers in the leftmost column are memory addresses; the numbers to the right show the actual contents of each successive location. Unless you're very familiar with hex notation and the 6502 instruction set, it's difficult to understand the program in this form. As a convenience, the monitor can translate machine language instructions from a series of raw numbers into more descriptive mnemonic labels. This process is called disassembly. Here's how a monitor would disassemble the numbers seen in the display above:

```
,C000 A9 42 LDA #$42
,C002 20 06 C0 JSR $C006
,C005 60 RTS
```

```
,C006 20 D2 FF JSR $FFD2
,C009 20 D2 FF JSR $FFD2
,C00C RTS
```

Each three-letter mnemonic stands for a single ML instruction. In this example, the LDA (Load A) instruction loads the ASCII value for the letter B (hex \$42) into the computer's A register, also called the accumulator. The JSR (Jump to SubRoutine) instruction calls a subroutine, much like GOSUB in BASIC. RTS (Return from Subroutine) terminates a routine, much like RETURN in BASIC.

The converse of disassembly is assembly, which lets you write a program by typing in mnemonics rather than numbers. To assemble the first line of the above program, for instance, you would type this line into the machine language monitor:

```
A C000 LDA #$42
```

This puts the numbers \$A9 and \$42 into memory locations \$C000 and \$C001, where the computer interprets them as Load A with \$42.

In addition to memory display, disassembly, and assembly, a monitor can perform other general tasks such as moving the contents of one memory area to another area, filling memory with a certain value, saving and loading an area of memory to tape or disk, and so forth. Monitors are so useful, in fact, that several computers, including the Commodore PET, Apple II, and Commodore 128, include one as a built-in feature.

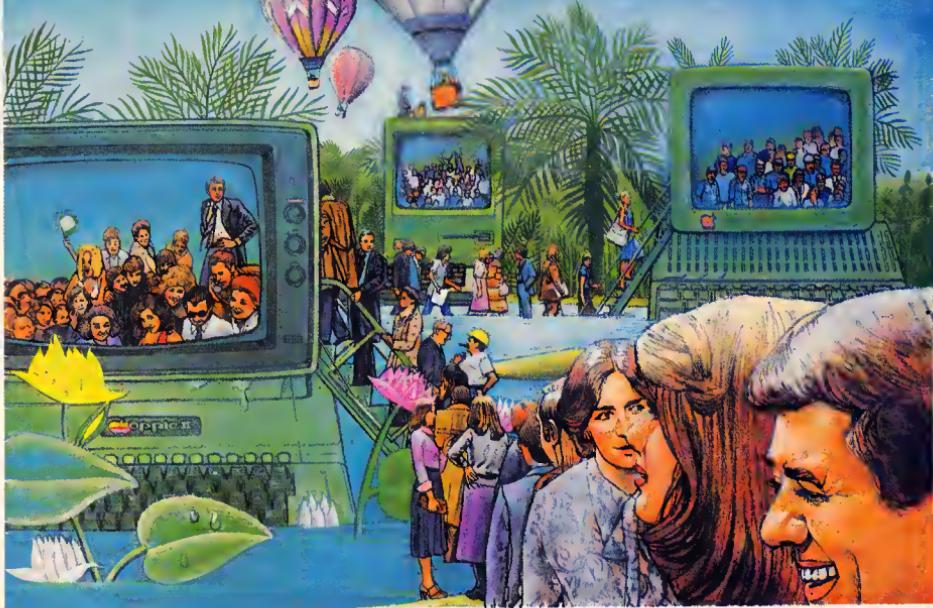
An assembler, as the name implies, is intended to do only one job—assemble an ML program from mnemonics. Since it usually can't disassemble the contents of memory, do memory moves, etc., an assembler is less versatile than a monitor. And programming with an assembler requires two steps instead of one. First you write a text file containing all the program instructions; this file is called the source code. Then you run the assembler, which translates the source code into executable object code. At first, the assembler sounds more cumbersome to use. But except for very short programs, it's considerably more convenient than a monitor. To illustrate, here's what the source code for this program might look like (this example is written in a format for the Commodore 64 PAL assembler; other assemblers are very similar):

```
100 sys 700
110 .opt p4
120 *= 49152
130 letter = 66
140 chROUT = $ffd2
150 ; print 'B' twice
160 lda #letter
170 jsr print2
180 rts
190 print2 = *
200 jsr $ffd2:jsr $ffd2
210 rts
220 .end
```

This assembler lets you write, save, and reload the ML source code as if it were a BASIC program, using sequentially numbered program lines. (Other assemblers provide similar functions.) Just as in BASIC, you can combine more than one statement on a single line (see line 200). Descriptive names can be given to constants (line 130), variables, ROM routines (140), and memory locations within the program itself (190). Assemblers also permit more flexibility of expression than monitors. Usually, decimal and hexadecimal numbers can be used interchangeably, and the assembler can evaluate strings and complex expressions as well. In this program, for instance, you can replace LDA #LETTER with LDA #\$42, LDA #66, LDA #'B', or even LDA #6+6*10.

The ability to use labels makes well-written assembler code much more readable than a monitor disassembly. The instruction JSR PRINT2, for instance, is more informative than JSR \$C006. Labels also eliminate the need for tedious address calculations and simplify the process of relocating a program from one area of memory to another. When writing this program for an assembler, you don't need to know where the routine PRINT2 will actually end up in memory; the assembler handles such details for you automatically. With a monitor, on the other hand, you need to calculate the actual address of the subroutine before you can type in the JSR instruction that calls it. To move this program from location 49152 to 24576, you would simply change the origin statement in line 120 to *= 24576 and reassemble the code. The assembler automatically adjusts everything to fit the new location.

Even greater flexibility is offered through pseudo-ops (pseudo-operations), which control various assembler functions. For instance, the .OPT pseudo-op



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(line 110) tells the assembler where to send its output. By changing this instruction you can send output to memory, a disk file, the screen, or a printer. Assembling to a printer is particularly useful for making documentation, since the output includes everything you would see in a monitor disassembly (addresses, opcodes, and mnemonics) as well as all the comments and so forth contained in the assembler source file.

Other assembler pseudo-ops let you perform more advanced operations such as a conditional assembly, which can include different segments of code (perhaps specific to various computers) in the assembly only when certain IF tests are satisfied. For long programs, a linked assembly allows you to assemble two or more separate source files into a single object file. The latter method was used to assemble the SpeedScript word processor, since the source code for that program is too long to fit in the computer's memory all at once.

Atari BASIC Errors

Only recently have I become obsessed with home computers. As a novice, I decided to start with an Atari 400 (a 1982 model, I believe) and a cassette recorder. After many hours spent typing in your programs, I was constantly rewarded with error messages. I finally discovered that the BASIC cartridge accompanying the computer had since been revised twice. Not being able to locate the revision C cartridge in Dallas, I wrote Atari. No answer yet. Can you provide any insight? Also, is the 400 capable of using a disk drive, or am I stuck with tape?

Tom Rowan

It's true that Atari BASIC has been revised twice since your Atari was made, but it's unlikely that this is the source of your problems. The two revisions—known as revision B and revision C—mainly fix bugs in the original Atari BASIC cartridge. These bugs, however, don't cause spurious error messages. Usually they either lock up the computer entirely or mangle text strings. Your error messages are almost certainly due to mistakes in the programs, not problems with your BASIC.

You don't say whether the error messages appear when you're typing the programs or running the programs. Atari BASIC is one of the few BASIC languages that has instant syntax checking, so if you get an error immediately after typing a line and pressing RETURN, it usually means that a BASIC command was misspelled, a parenthesis was omitted, or the command is being used improperly. Examine the line carefully for any typos. If you can't find any, refer to the Atari

BASIC Reference Manual to see if the command usage is legal. For example, the statement `A=CHR$(A$)` generates an error because the `CHR$` function is intended for converting a number into a string, and the variable `A$` is already a string.

Error messages encountered while you're trying to run a program are not due to syntax errors. Usually they indicate that the program is asking the computer to do something impossible. For example, the one-line program `10 GOTO 20` generates the message `ERROR 12 AT LINE 10`. If you look up this error number in the Atari BASIC Reference Manual, it means *Line Not Found*. The command `GOTO 20` tells the computer to branch to line 20, but this program has no line 20. If you're typing in listings from *COMPUTE!*, you can avoid most of these mistakes by using our "Automatic Proofreader" program found in *every issue*.)

If you'd still like a revision C Atari BASIC cartridge—worth having for only \$15—you can order one from Atari. (Atari Corp., Customer Relations, 390 Caribbean Drive, Sunnyvale, CA 94088.) Be patient, though. It takes quite some time for Atari to fill these orders.

The Atari 400 is quite capable of using a disk drive if it has at least 16K of Random Access Memory (RAM). Early 400s had only 8K RAM. You can find out how much memory your 400 has by plugging in `C64`, typing `NEW`, and entering `PRINT FRE(0)`. A 16K machine should return a number around 13000. However, we recommend at least 32K for use with a disk drive. A drive requires that you load a special program called a Disk Operating System (DOS), and this would consume more than half the available memory on a 16K system, leaving very little room for your BASIC program. The 400 can be upgraded to 48K or 64K, but the memory board installation isn't trivial. Also, for a few dollars more you could probably buy a new 800XL or 65XE.

Commodore 128 Sprites

I really enjoy programming with my new Commodore 128. However, using sprites has left me quite frustrated. The system guide's explanation of sprites doesn't explain how you can have more than eight sprite definitions in memory. Is there any way to do this?

Matt Lindquist

The Commodore 128 has room for only eight sprite shapes in its sprite definition area (memory locations 3584-4095). However, BASIC 7.0 includes a command (`SPRSAV`) which lets you move sprite shapes from strings into the sprite definition area and vice versa. Here is one form of `SPRSAV`:

`SPRSAV 1,A$`

This command moves the definition for sprite 1 into the string `A$`. Now the shape data is stored for later use. Here's the opposite form of `SPRSAV`:

`SPRSAV A$1`

This command moves the shape data stored in `A$` into the definition area for sprite 1. Of course, you can replace the name `A$` with any legal string variable name.

The following program draws 16 sine waves on the screen, each positioned a little differently, then saves the sprites in the array `A$` using the `SSHAPE` command. After all the shapes have been drawn and saved, sprite 1 is displayed on the screen. `SPRSAV` is then used to flip between the various sprite shapes. The rapid display of shapes makes the sine wave appear to move.

(Note: The underlined up-arrow (↑) in line 30 means to hold down the SHIFT key while pressing the up-arrow key. This will produce the pi (π) symbol.)

```
10 FAST
20 DIM A$(16)
30 FOR V=0 TO ↑*2 STEP ↑/8
40 GRAPHIC 1,1
50 FOR X=0 TO 23 STEP .2:Y=INT((11+10*SIN(X/2+V))):DR AW 1,X,Y:NEXT
60 SSHAPE A$(SN),0,0,23,20
70 SN=SN+1:NEXT V:GRAPHIC 0
80 SPRITE 1,1,2,1,1,1,0
90 MOVSPR 1,120,80:MOVSPR 1,90#3
100 FOR A=0 TO 15:SPRSAV A$(A),1:FORT=1705:NEXT:NE XT A:GOTO 100
```

Apple Double Hi-Res Graphics

I'm having trouble understanding how the double high-resolution graphics mode works on my Apple IIc. How does the computer store the color and dot information? Is it possible to convert a normal hi-res picture to double hi-res format?

Robert Colello

An Apple II that has 128K of Random Access Memory (any Apple IIc, or a IIe with extended 80-column card) can display pictures that have twice as many pixels across as normal hi-res pictures: that's 560 pixels in double hi-res versus the normal 280-pixel resolution. This display mode works in about the same way as 80-column text mode. For every byte of normal display memory, there's another byte with the same address in another bank of memory, called auxiliary RAM. In normal hi-res mode, one byte of display data tells the computer how to draw seven pixels on the screen. In double hi-res, 14 dots can be drawn in the same space on the screen. The first seven dots are

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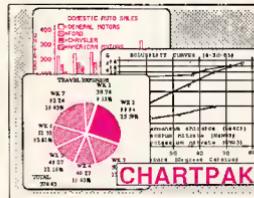


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from auxiliary memory and the second set comes from main RAM.

One double hi-res screen occupies 16K of memory between addresses 8192-16383 (\$2000-\$3FFF) in each bank. Unlike standard hi-res, there's only one double hi-res screen, so it's not practical to create animation with page flipping.

Here are some routines that will help you get started with double hi-res graphics. When run, they create machine language programs called DCONVERT and DHGRSAVE. If you load a normal hi-res picture into hi-res screen 1 (at 8192) then BRUN the DCONVERT program, it converts the picture to double hi-res format and displays it.

To save this or any other double hi-res picture to disk, BRUN the DHGRSAVE program, then enter BSAVE filename \$A\$2000,L\$4000 (replace filename with the name of your choice). The graphics image is saved in the same format used by Dazzle Draw and other double hi-res programs. If you save the image file on a ProDOS disk, you can then load it with Dazzle Draw and modify the picture.

```
80 FOR I = 24576 TO I + 161:
```

```
  READ A: POKE I, A: NEXT
```

```
90 PRINT CHR$(4): "BSAVE DCON
```

```
VERT, A$6000, L$2A"
```

```
100 DATA 141, 126, 192, 173, 94, 1
```

```
  92, 173, 87, 192, 173, 82
```

```
110 DATA 192, 141, 13, 192, 141, 0
```

```
  , 192, 173, 88, 192, 169
```

```
120 DATA 0, 133, 254, 169, 32, 133
```

```
  , 255, 160, 0, 177, 254
```

```
130 DATA 72, 72, 41, 15, 170, 189,
```

```
  146, 96, 141, 163, 96
```

```
140 DATA 104, 74, 74, 74, 74, 41, 7
```

```
  , 170, 189, 146, 96
```

```
150 DATA 141, 152, 96, 104, 16, 11
```

```
  , 173, 163, 96, 281, 128
```

```
160 DATA 173, 152, 96, 42, 144, 27
```

```
  , 78, 163, 96, 136, 48
```

```
170 DATA 10, 177, 254, 8, 10, 10, 4
```

```
  0, 106, 74, 145, 254
```

```
180 DATA 203, 173, 162, 96, 44, 59
```

```
  , 96, 240, 2, 9, 64
```

```
190 DATA 145, 254, 173, 163, 96, 4
```

```
  1, 127, 141, 5, 192, 145
```

```
200 DATA 254, 141, 4, 192, 200, 19
```

```
  2, 40, 208, 168, 165, 254
```

```
210 DATA 105, 127, 133, 254, 144,
```

```
  2, 230, 255, 165, 255, 281
```

```
220 DATA 64, 208, 150, 165, 254, 1
```

```
  05, 39, 133, 254, 201, 120
```

```
230 DATA 208, 136, 96, 0, 3, 12, 15
```

```
  , 48, 51, 60, 63
```

```
240 DATA 192, 195, 204, 207, 240,
```

```
  243, 252, 255
```

```
80 FOR A = 4096 TO A + 47: RE
```

```
  AD I: POKE A, I: NEXT
```

```
90 PRINT CHR$(4): "BSAVE DHGR
```

```
SAVE, A$1000, L$30"
```

```
100 DATA 160, 0, 132, 252, 132, 25
```

```
  4, 169, 32, 133, 253, 169
```

```
110 DATA 64, 133, 255, 141, 1, 192
```

```
  , 173, 87, 192, 177, 252
```

```
120 DATA 145, 254, 141, 85, 192, 1
```

```
  77, 252, 141, 84, 192, 145
```

```
130 DATA 252, 200, 208, 239, 230,
```

```
  253, 238, 255, 165, 257, 201
```

```
140 DATA 64, 208, 229, 96
```

Saving PCjr Screens

I have been experiencing trouble with BSAVEing SCREEN 5 on my PCjr. For some reason, the computer loads only half the picture when I try to bring it back into memory.

Marc Ramirez

The PCjr was designed to be as compatible as possible with the IBM PC, but there are several differences, most notably the lack of DMA (Direct Memory Access) hardware that speeds certain operations on the PC. On the other hand, the PCjr has better color graphics than the PC. Its SCREEN 5 mode gives you 320 × 200 resolution with 16 simultaneous screen colors. These don't represent fixed colors as in the PC-compatible modes. Instead, each of the 16 colors can be redefined to use any of the 16 possible colors, making available the advantages of color indirection.

The IBM PC color/graphics card contains 16K of onboard RAM for its own use. Because the RAM is part of the color card, there is no conflict when both the screen and the microprocessor want to access memory at the same time. However, references to addresses \$B8000-\$BC000 are redirected to the color card's memory, which permits the microprocessor to update screen memory and redraw the screen directly.

The PCjr, however, has no memory at \$B8000. Screen memory is taken from the main store of RAM, usually at location \$18000. This explains why the PCjr is slower than its big brother. The graphics chips need to access screen memory constantly while building the screen, and since this memory is on the main address bus, the microprocessor can't get at memory to execute instructions while the graphics chips are using it.

However, IBM realized that many commercial programs try to update the screen by storing values directly into screen memory at \$B8000. To keep the PCjr compatible with these programs, IBM modified the address circuitry to redirect references to \$B8000 to the actual screen memory area. However, only 16K of memory is redirected. Since a SCREEN 5 screen is 32K long, this explains why you're seeing only half of the picture.

When you use the sequence

```
DEF SEG=&H1800:BSAVE "screen", 0
```

```
, 32768!
```

the first 16K of memory is saved from the area at \$18000, but the rest of the picture is saved from \$BD000-\$COFF, since this memory range is not relocated. This second half is just whatever random bits are read when this nonexistent memory is saved. Instead, you need to use

```
DEF SEG=&H1800:BSAVE "screen", 0
```

```
, 32768!
```

to save the screen, and

DEF SEG=&H1800:BLOAD "screen"

to load it back. If you try to load images saved from the original range of \$B8000-\$COFF, the second interleaved half of the picture will be garbage. If you use two or more graphics screens, the additional screens are stored behind the first one at lower memory locations. The first SCREEN 5 screen would be at \$18000, the second would be stored at \$10000, and so forth.

TurboDisk With 64 SpeedScript

Now that the commented source code for SpeedScript is available in book form, I have found ways to make the program work in all kinds of situations. Here are a couple of SpeedScript modifications I have found very useful.

Only two POKEs are needed to allow you to use "TurboDisk" (the fast-load utility published in the April 1985 issue of COMPUTE!) with SpeedScript. First, load in your copy of SpeedScript (version 3.0 or higher). Now enter these POKEs in direct mode (without line numbers). Be sure to press RETURN after typing each line:

```
POKE 2481, 191
```

```
POKE 4938, 8
```

Now resave the program, using a different filename (perhaps SPEEDSCRIPT.TURB) to differentiate it from the original. To use the modified program, simply activate TurboDisk as usual, then load and run SpeedScript. You'll find that text files are loaded much faster than usual. If you exit SpeedScript, you must reactivate TurboDisk with SYS 49152.

A second useful change has to do with word wrap—SpeedScript's ability to automatically move a word down to the next line when it's too big to fit on the current line. Word wrap is great for making text readable, but creates headaches when you need to align the right margin or line up decimal points past the fortieth column. The following program replaces SpeedScript's Verify command (which I have never used) with a function that toggles word wrap on and off. Type in the following program and save a copy, then run it and follow the prompts (tape users note the line change below).

```
10 FORQ=49152T049198:READA:
```

```
  X=X+A:NEXT:I=IPX->6412 THEN
```

```
  PRINT"ERROR IN DATA":EN
```

```
  D
```

```
20 RESTORE:FORQ=49152T04919
```

```
  8:READA:POKEQ,A:NEXT
```

```
  30 PRINT"["CLR"]W[H]LOAD YOU
```

```
  R VERSION OF"
```

```
  40 PRINT" SPEEDSCRIPT 3.0 OR
```

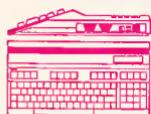
```
  HIGHER"
```

```
  50 PRINT" THEN SYS49152 AND
```

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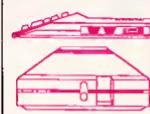
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```

{SPACE}RUN."
49152 DATA 162,35,189,12,19
2
49157 DATA 157,26,20,202,16
49162 DATA 247,96,173,219,8
49167 DATA 201,177,208,17,1
69
49172 DATA 169,141,219,8,16
9
49177 DATA 32,141,220,8,165
49182 DATA 197,201,31,240,2
50
49187 DATA 96,169,177,141,2
19
49192 DATA 8,169,251,141,22
0
49197 DATA 8,9,6

```

After POKEing a short ML routine into memory, the program instructs you to load *SpeedScript* (3.0 or higher), enter SYS 49152, then run *SpeedScript*. Try toggling word wrap on and off by pressing CTRL-V (ordinarily the Verify function).

If you use tape instead of disk, you may not want to give up the Verify function but can easily afford to live without the Directory command, which is useless with tape anyway. In line 49157 of the program, change the 26 to 98. Then change the checksum value in line 10 from 6412 to 6484.

When you're satisfied that the modification works, exit *SpeedScript*. Disk users should enter POKE 2895,23 to change the Verify command from CTRL-V to CTRL-W (for Word wrap). Tape users should enter POKE 2898,23 to change the Directory command from CTRL-4 to CTRL-W. After that's done, resave *SpeedScript* under a new file name that reflects the change.

Bruce S. Gordon

Thanks for the suggestions. Incidentally, the penalty you pay for turboloading with *SpeedScript* is that available text memory is reduced from 43,445 characters to 39,299 characters.

Improved Atari Line Delete

Like many BASIC programmers, I usually number my programs with an increment of 10. Often, however, after editing and debugging, there is no longer any pattern to line numbering. This short utility program has a little more versatility than "Line Deleter For Atari," published in the January 1986 issue of *COMPUTE!*. As in the former, LIST the utility to disk or cassette, then load your BASIC program and ENTER this utility. Type GOTO 32700 in direct mode, then input the beginning and end range to be deleted. You can now delete only existing line numbers. When the deletion is finished, press RETURN to remove the utility from your BASIC program.

```

32700 REM BLOCK DELETE ENTER AND GOTO 32700
32701 TRAP 32713:?"START
,END":INPUT START,E
N
32702 ? CHR$(125):X=PEEK(
138)+PEEK(139)*256
32703 B=PEEK(136)+PEEK(13
7)*256:X=B:QQ=0:POS
ITION 2,2
32704 LN=PEEK(X)+PEEK(X+1
)*256
32705 IF LN<START THEN X=
X+PEEK(X+2):GOTO 32
704
32706 IF LN=32700 THEN 32
710
32707 ? LN:QQ=QQ+1:IF QQ=
18 THEN 32710
32708 IF LN=EN THEN 3271
0
32709 X=X+PEEK(X+2):GOTO
32704
32710 TRAP 32713:?"32700
REM PRESE RETURN T
O REMOVE BLOCK DELE
TER":?"CONT"
32711 POKE B42,13:POSITION
N 2,0:STOP
32712 POKE B42,12:GOTO 32
700
32713 ? CHR$(125):POSITION
N 2,2:FOR SS=32700
TO 32714:?"SS:NEXT
SS:?"POKE B42,12"
32714 POKE B42,13:POSITION
N 2,0:STOP

```

Gary Rindosh

Thank you for the program.

Dvorak Keyboard For 64

After 25 years of typing the "qwerty" way, I'd like to take advantage of a Dvorak keyboard toggle included in a *SpeedScript* enhancement program for the Commodore 64. What resources are available to help me learn the Dvorak system? Are keyboard caps for the 64 available so that I can cover up the normal keys with Dvorak caps? It's going to be hard giving up the old system, but everything I've heard about the speed and efficiency of the Dvorak keyboard makes me eager to give it a try.

John Willis

If your enhancement program can emulate the Dvorak keyboard within *SpeedScript*, then no hardware is required to convert from the conventional typewriter key arrangement—often called "qwerty" to the Dvorak scheme. Many office supply stores carry stick-on keycap labels that should suit your needs. We're assuming that you have a diagram which shows the Dvorak keyboard.

The advantage of stick-on labels is that you can still use the computer for other purposes that don't involve a Dvorak keyboard. Most commercial software and virtually all type-in programs in publications like *COMPUTE!* assume that you have a normal 64 keyboard. If you can find

or fabricate blank stick-on labels, you could divide each label into two segments—indicate the Dvorak key on one half and the normal 64 key on the other. This would allow you to switch from Dvorak to query applications at will.

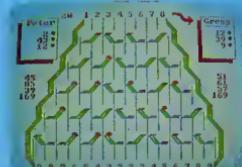
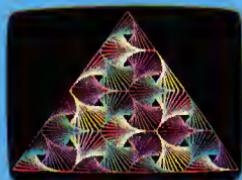
If you don't use the computer for anything other than word processing and decide to convert permanently to the Dvorak scheme, you could rearrange the existing keycaps. This operation doesn't require any special tools or electronics expertise. While you have the old keycaps off, you can take advantage of the opportunity to clean the keyboard, too. However, rearranging the keycaps will void any warranty that may be in effect, since you must open the case of the computer. And though the operation is reversible, you should consider it semipermanent because of the time involved in switching the keycaps.

To rearrange the keycaps, remove the three Phillips screws in the bottom of the computer's case, then gently separate the two halves of the case. Carefully unplug the two sets of wires that join the upper and lower halves, then remove the eight Phillips screws that hold the keyboard assembly to the upper half. The 64's keycaps are held on by friction, so you can lever them off using a thin-bladed screwdriver or similar device. The alphanumeric keycaps are all the same size and can be interchanged freely. Of course, you shouldn't disturb keys such as RESTORE, which serve a special purpose. While the keycaps are off, you may want to clean the area around each keyswitch. In many cases, cleaning is all that's needed to fix keys that stick or bounce (repeat when they shouldn't).

To replace a keycap, press it gently but firmly onto the shaft of the keyswitch. After all the keycaps are back in place, reverse the disassembly procedure: Screw the keyboard assembly back into the upper half of the case, then replace the two sets of wires that join the halves. Finally, rejoin the two halves of the case, turn the computer over, and replace the three screws on the bottom. If you've never performed the operation before, you should plan to spend a couple of hours removing, cleaning, and replacing the keycaps.

By the way, you might be interested to learn that there is some controversy surrounding the efficiency claims for the Dvorak keyboard. Most of the frequently quoted statistics (like 35-50 percent increase in speed and 90 percent reduction in finger travel) come from August Dvorak's own research. An independent investigation by Donald Olson and Laurie Jasinski, published in the February 1986 issue of *BYTE* magazine, suggests that these figures are inflated. While agreeing that the Dvorak arrangement is somewhat

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Writing a machine language program that will run in memory is a difficult task. The first hurdle is finding a safe place to put the code. I thought of using the first 256 bytes of memory. This chance is located in different memory locations on different machines. It then creates problems for tape users because of the limitation of BASIC programming space.

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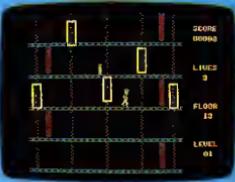
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more efficient, that article reports that the actual reduction in finger travel is less than 30 percent. It also quotes a University of California study which concluded that a speed increase of 5-10 percent was more realistic.

Automatic IBM Screen Printing

Some time ago I created a BASIC program which allows me to create graphics pictures much like a graphics editor. The program uses every graphics function in the manual, and even saves your work. But in order to print my creations on the printer, I have to press Shift-PrintSc. Is there any way to add a Print Screen function to my program?

William Green

Fortunately, it's quite easy to call the ROM BIOS routine that supports screen printing. The following program fragment does the trick by POKEing a tiny machine language program into a reserved space at the top of BASIC's memory area. The ML just executes INT5:RETf to call the Print Screen routine and return to BASIC. This program is adapted from COMPUTE!'s Mapping the IBM PC and PCjr, by Russ Davies.

When incorporating this routine into your program, the line with the CLEAR statement must be the first line in your program. Otherwise, any previously defined variables will be erased. Once the machine language is POKEed into memory, your program can execute the statement CALL PRTSC to make a printout.

```
100 CLEAR ,&HFF0: PRTSC=&HFF0
110 DEF SEG: FOR X=0 TO 2: READ
    N: POKE X+PRTSC, N: NEXT
120 DATA &HCD, &H05, &HCB
200 CALL PRTSC
```

Atari DOS 3.0 Vs. 2.5

I have purchased an Atari 1050 disk drive with DOS 3.0. I recently heard that this DOS is no good, and that I should use DOS 2.0 or 2.5. What is so wrong with DOS 3.0, and why shouldn't I use it? Is DOS 2.5 the best one yet for the 1050, and where can I get it?

Gary Cerasoli

Before getting to your questions, let's briefly review the history of Atari disk operating systems:

• DOS 1.0 was introduced with the 400/800 computers and 810 disk drive in 1979. It was workable, but suffered from some bugs and unimplemented features. Also, the entire DOS was always resident in RAM (Random Access Memory). Although this was convenient—the DOS menu appeared instantly when you typed

the DOS command—it consumed too much memory in period when few people had more than 24K or 32K of RAM. • DOS 2.0, also known as 2.0S (single-density), replaced DOS 1.0 in late 1980/early 1981. It fixed the bugs in DOS 1.0, added significant new features, and conserved memory by keeping only part of itself in RAM. The disk-resident portion of DOS 2.0 loads into memory only when you type the DOS command.

• DOS 3.0 was introduced with the dual-mode 1050 disk drive in 1983. The 1050 works in the traditional Atari single-density mode (88K of storage per disk) as well as an enhanced-density mode (127K of storage per disk). DOS 3.0 was designed to support the enhanced-density mode and to be easier to use. But most Atari users found DOS 3.0 to be clumsy and inconvenient, especially when swapping disks with other people or when mixing single-density and enhanced-density disks. Although the 1050 drive automatically adjusts itself for either density, DOS 3.0 disks and 2.0 disks are incompatible with each other.

• To solve these problems, DOS 2.5 was introduced in 1985. This numbering scheme sometimes confuses people, since 2.5 was released two years after 3.0, but 2.5 is so named because it is closely related to DOS 2.0. In fact, the 2.5 menu is almost identical to the 2.0 menu, save for one additional option (Format Single). The advantage of 2.5 is that it works with both single- and enhanced-density disks on the 1050 drive as well as single-density disks on the older 810 drives. This makes life easier for people who have both formats in their disk libraries and for those who swap disks with other users.

DOS 2.5 is available free from most Atari dealers and user groups. It comes with utilities for converting 3.0 files to 2.0/2.5 format, for customizing your copy of 2.5, and for automatically booting up a RAM disk on the 130XE computer.

There's a chance that 2.5 may be superseded in the near future by yet another DOS. Atari is thinking about introducing a 3 1/2-inch disk drive for the 400/800/XL/XE line, and the much greater capacity of this format (at least 320K per side) would require a completely new DOS with support for subdirectories and other advanced file-management features.

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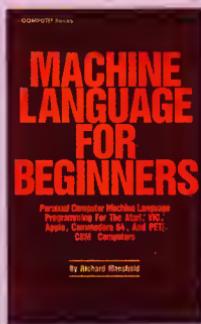
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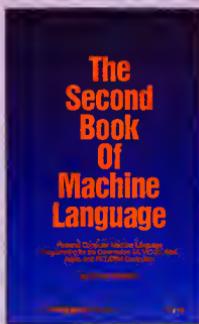
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Report From The Summer Consumer Electronics Show:

An Eight-Bit BONANZA

Selby Bateman, Features Editor

Forget any rumors you've heard about weakening in the 8-bit computer lines. The Summer Consumer Electronics Show revealed plenty of new software and hardware for Commodore, Atari, Apple, and IBM 8-bit machines. Also on display were scores of new software packages for the Atari ST and a growing number for the Commodore Amiga. The happy news is that both Commodore and Atari are making efforts to extend the life of their popular 8-bit computers at the same time that they're pushing the newer 16-bit models.

The 68000-based Amiga, ST, and Macintosh computers may be getting headlines these days, but it's the 8-bit machines which are continuing to provide much of the income for manufacturers and excitement for millions of satisfied users.

Proof of that came at the recent Consumer Electronics Show (CES) in Chicago—a semiannual showcase of all the consumer electronics products you'll be seeing on store shelves this fall and winter. Amid

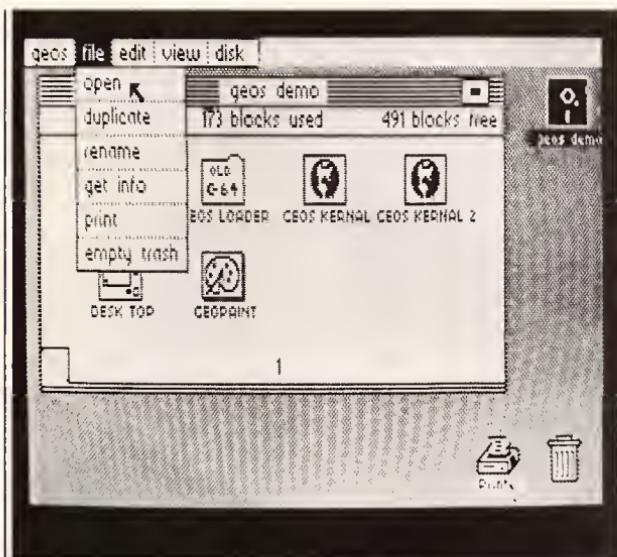
the newest high-tech digital audio players, 3-D televisions, videocassette machines, car stereos, credit-card-sized radios, and satellite dishes, a few dozen computer software companies displayed a wealth of new programs for Commodore, Atari, Apple, and IBM machines.

But what a difference a year can make in the fortunes of individual computer companies. Twelve months ago at CES, Commodore displayed its 64 and 128 machines in a large, heavily traveled booth on the main floor, while Atari was ensconced in a couple of meeting rooms on the mezzanine showing its fledgling Atari ST. Rumors circulated everywhere about the pending introduction of Commodore's Amiga, which was scheduled for a July release.

This year the tables were turned. While Atari occupied a large, crowded booth full of third-party software developers supporting the ST, Commodore occupied the mezzanine rooms showing its newly packaged 64. No mention was made of the Amiga, which Commodore showcased heavily at the Atlanta COMDEX show in late

April, and which it obviously feels should be promoted in business markets. At a time when Atari has seen its efforts with the ST begin to bear financial fruit, Commodore has been racked by heavy financial worries. Layoffs at the West Chester, Pennsylvania, headquarters and at the Los Gatos, California, Commodore/Amiga offices occurred this spring. Sales of the Amiga have been slower than expected, and it's been the enduring strength of the 64 and the newer 128 that has helped the company fight against tremendous quarterly losses.

Even with its current financial problems, no one is counting Commodore out. In fact, the company hopes the rest of 1986 and early 1987 will see a reversal, with a leaner corporate staff, a new look for the unstoppable Commodore 64, new software and heavy sales of the 128 (now more than 600,000 sold), and a slowly rising tide of Amiga sales. Nonetheless, it's clear that the ST's popularity has hurt the Amiga. One rumor at CES, unsubstantiated at this point, is that a new, less expensive version of the Amiga is under development,



GEOS: A new face for an old friend.

which would compete more effectively with the ST.

The 64's New Look

As we reported in last month's "Editor's Notes," Commodore introduced at CES the new 64C, a repackaged Commodore 64 computer that cosmetically resembles the 128. Bundled with it are two disks, the first containing the icon-based GEOS operating system and *geoWrite* and *geoPaint* application programs on one side. On the other side of that disk is a terminal program for use with the Commodore-specific QuantumLink telecommunications network. The second disk contains *Odell Lake*, an educational program from MECC which teaches children about the environment within a lake. Internally, the 64C is identical to the original 64.

The 64C computer and software combo has a suggested retail price of under \$250, probably around \$225 according to one source. The present generation of 64s retails for about \$150 nationally, but without any software. Once existing stocks of the older unit are depleted, the 64C package will be the only 64 available. The GEOS/QuantumLink disk is also available for current 64 owners for \$59.95.

GEOS (Graphic Environment Operating System) brings to the 64 the type of Macintosh-style, or GEM-style, user interface available on the ST, Amiga, and Macintosh machines. GEOS loads from disk, replacing the 64's ROM-based operating system, and displays a desktop environment with icons, drop-down menus, and windows. You can use your joystick or a mouse to move around the screen. What's more, disk operations are speeded up by a factor of from five to seven times. Menu titles such as



The new Commodore 64C sports a sleeker look. A disk containing GEOS and Quantum Link terminal software is bundled with the computer.

File, Edit, View, and Disk open to reveal additional choices under each heading. Also included on the disk are powerful programs for productivity applications in the home market—word processing, calculation, and graphics design. Although there are still some memory constraints imposed by GEOS on the 64's available RAM (Random Access Memory), Commodore plans to introduce later this year a memory expansion cartridge for the 64 like the unit now available for the 128. (For more information on GEOS, see the CES report in the April 1986 COMPUTE!.)

New 128-style cases have also been developed for the 1541 drive (now the 1541C) and the 1702 color monitor (now the 1802). Commodore was also displaying a new color monitor for the 64 and 128, the 1902A, which can handle composite video as well as digital RGB (red-green-blue) signals. There's also a button that gives you a green screen.

Although reactions to GEOS from software companies were mixed, the overall response seems to have been favorable, according to representatives from several companies who attended a GEOS development seminar hosted by Commodore and Berkeley Softworks. The result, if all goes according to plan, is for third-party software developers to produce programs for the new 64C that operate under the easy-to-use GEOS interface. The procedure is not difficult, says one of the manufacturers, and could provide an entirely new uni-

Earth will be destroyed in 12 minutes to make way for a hyperspace bypass.

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>DRINK THE BEER

And the story responds:

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AND TELL YOU WHAT A GREAT CHAP YOU ARE AND THEN THE EARTH GETS UNEXPECTEDLY DEMOLISHED, YOU WAKE UP WITH A HANGOVER WHICH LASTS FOR ALL ETERNITY, YOU HAVE DIED.

Suppose, on the other hand, you decide to:

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>WRAP THE TOWEL AROUND MY HEAD

And the story responds:

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announced Apple II 16-bit computer.

Another popular topic of industry conversation centered on the swiftly dropping prices of IBM PC work-alikes, called clones, that are expected to be as low as \$300 by the Christmas season. The IBM clones, from Korea, Taiwan, Japan, and even the U.S., are already beginning to sell into consumer markets. And that trend is expected to continue. Heavy sales of the Tandy 1000 and rumors about extremely inexpensive clones have caused some software publishers to consider beefing up their IBM offerings.

Although a complete list of software and hardware showcased at CES is beyond the scope of this article, the following products were among those introduced for Apple, Atari, Commodore, and Atari 8-bit computers. For more product information, see the "News & Products" section in this issue; for information on new products introduced for the 16-bit machines, see Tom Halfhill's story elsewhere in this issue.

Electronic Arts: Electronic Arts continues its major commitment to eight-bit computer owners with a long list of new titles for all machines. Among the new offerings are *Amnesia* (Commodore 64 version, \$39.95; Apple II, \$44.95), by Thomas M. Disch and Cognetics; *Autoduel* (Commodore 64, \$49.95), by Origin Systems; *Bard's Tale II: The Archmage's Tale* (Commodore 64), by Michael Cranford; *Battlefront* (Commodore and Apple versions, \$39.95), by Strategic Studies Group; *Chessmaster 2000* (Commodore, Apple, and Atari versions, \$39.95; IBM, \$44.95), by Software Country; *Scavenger Hunt* (Commodore and Apple II), by Ozark Softscape; *Timothy Leary's Mind Mirror* (Commodore version, \$32.95; Apple II, \$34.95), by Dr. Timothy Leary; *Ultimate Wizard* (Commodore 64, \$29.95), by Sean A. Moore and Steven Luedders; *Age of Adventure* (Apple II and Atari, \$14.95); and *Venture's Business Simulator* (IBM only, \$99.95), by Reality Development. (Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404.)

Abacus Software: In addition to its line of Atari ST and Commodore 128 books, Abacus displayed its *BASIC Compiler for the 128*

(\$59.95) along with the previously released 64 version (\$39.95). Also on display were the 128 versions of its CDPAK computer-aided design program, *Super-C Language Compiler and Super Pascal Development System* (\$59.95 each; 64 versions also available). Among a variety of other software packages, Abacus has now added *COBOL-64*, a Commodore version of the popular business programming language. (Abacus Software, P.O. Box 7219, Grand Rapids, MI 49510.)

The Learning Company: Two new products have been added to its collection of well-known educational software. *Writer Rabbit* helps develop the critical process of learning to use words and sentences. It offers several features that were implemented in response to requests made by children, teachers, and parents. The program includes several games, each of which enables the child to explore a different aspect of words and sentences in a fun and supportive setting. The games incorporate graphics and sound, and each game can be tailored to a child's own pace.

Math Rabbit teaches early math skills to children ages 5-7, and also incorporates entertainment to encourage children to participate. Available for Apple II series computers, each program has a suggested retail price of \$39.95. (The Learning Company, 545 Middlefield Rd., Suite 170, Menlo Park, CA 94025.)

Access Software: On the heels of its popular *Leader Board* professional golf simulator, Access introduced *10th Frame* (\$39.95), a professional bowling simulator for the Commodore 64. (Access Software, 2561 South 1560 West, Woods Cross, UT 84087.)

Multibotics: In cooperation with Access Software, this company is introducing a line of home robotics workshops for the Commodore 64 and 128, Atari 400/800/XL/XE, Apple IIe, IBM PC and compatibles, Commodore Amiga, and Atari ST.

The MB230 Workshops consist of an interface that connects the computer to snap-together robotics modules, plus software for controlling the modules. The software enables the computer to function as a

variable-speed motor controller, a voltmeter, an oscilloscope, an infrared controller/detector, and an audio digitizer. Retail prices for the workshops range from \$59.95 to \$199.95. (Access Software, see address above.)

Accolade Software: Accolade is introducing in late summer an arcade-action game called *Deceptor*. As you manipulate your Deceptor through six levels of increasingly difficult play, you can transform the robotic vehicle from ground-based to airborne, and finally into a humanoid shape. The game's responsiveness can be tailored to your liking, and you can practice most of the levels to increase your chances of survival. (Price unannounced.)

Accolade also announced Apple II and IBM versions (\$34.95 each) of its *PSI-5 Trading Company* science fiction adventure game. A Macintosh version (\$44.95) of the *Hardball* baseball game was also announced at CES. (Accolade Software, 20833 Stevens Creek Blvd., Cupertino, CA 95014.)

Springboard Software: The publisher of the bestselling *Newsroom* has introduced two new productivity packages with application in the home, school, and office.

The Newsroom Pro is aimed at the person who wants to take a more professional approach to producing a newsletter. It contains everything the user needs to produce a high-quality newsletter, including banner creation, text entry, graphic production, layout, and high-resolution printing. More than 2,000 pieces of clip art are included. It is available for the IBM-PC for \$129.95.

Certificate Maker provides more than 200 predesigned certificates, awards, diplomas, and licenses in a wide variety of categories such as sports, academic achievement, families, children, religion, and business. Available for Apple (\$49.95), IBM-PC (\$59.95), and Commodore 64 (price not yet determined). (Springboard Software, 7808 Creekridge Cir., Minneapolis, MN 55435.)

Activision: The Activision family of companies continues to expand, with the acquisition of Infocom, a well-known adventure game company. Infocom will maintain its own brand-name imprint under the Activision umbrella. Pre-

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viously acquired companies, such as Creative Software and Gamestar, continue to have an impact on the company's product line as well.

I Am the C-128 is one of the products in Activision's new Personal Choice Software line, which includes the *Writer's Choice* word processor, the *Filer's Choice* database, and *Planner's Choice* spreadsheet for the Apple II family, the Commodore 64/128, and the IBM PC, the Tandy 1000, and other MS-DOS computers. One of Activision's most popular products last year was the mystery adventure game *Hacker*. This year the company will introduce a sequel, *Hacker II: The Doomsday Papers*, which begins where the first program ended. Commodore 64/128 and Apple II versions will sell for \$39.95, while IBM PC/PCjr/Tandy 1000 and Macintosh versions will be priced at \$49.95 each. Activision remains one of the most prolific software publishers, with more titles scheduled for release after September 1. (Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043.)

Simon & Schuster: The software division of this publishing house has released *Webster's New World Writer*, a versatile word processor (IBM-PC with 256K, \$150), and *Webster's New World On-Line Thesaurus*, a 120,000-word thesaurus compatible with more than 30 major word processors and other software packages (IBM-PC with 128K, PCjr with 256K; \$69.95). (Simon & Schuster Software, Gulf & Western Bldg., One Gulf & Western Plaza, New York, NY 10023.)

Avalon Hill: The Microcomputer Games division of Avalon Hill also announced a variety of new titles for Apple, Atari, Commodore, and IBM computers.

Spitfire 40 is a World War II air-war game and flight simulator for the Commodore 64/128 (\$35), with conversions for other machines already under way. The popularity of Avalon Hill's *Super Sunday* football game has encouraged the company to introduce 1985 expansion disks for use with the original game, for Commodore 64/128 and IBM machines (\$20 each).

Macbeth is a graphics-and-text adventure game based on the Shakespearean play, for Commo-

dore 64/128 (\$25). In August, Avalon Hill will introduce *Darkhorn*, a fantasy warfare game, for the Apple II and Commodore computers (\$30). A science fiction arcade-action game, *Mission on Thunderhead*, is now available for Apple II, Atari 800/XL/XE, and Commodore 64/128 computers (\$25). Expansion modules, one for Extended Units and the other for the Campaign Disk, are also available for the previously released *Under Fire!* strategy game. (Avalon Hill, Microcomputer Games Division, 4517 Harford Road, Baltimore, MD 21214.)

Bantam Electronic Publishing: Two new Apple II and Commodore 64 programs scheduled for fall release were displayed by Bantam at CES. The packages feature popular Disney cartoon characters in productivity programs.

Each program will carry a retail price of \$39.95 for Apple II versions, and \$34.95 for Commodore 64/128 versions. (Bantam Electronic Publishing, 666 Fifth Ave., New York, NY 10103.)

Softsync: This company has premiered *The Model Diet* (Commodore 64, \$29.95; Apple II, IBM-PC, \$34.95), a computerized diet and nutrition program; and *Desk Manager* (Commodore 64, 128, Apple II, \$39.95), a desktop accessory that uses windows. (Softsync, Inc., 162 Madison Ave., New York, NY 10016.)

Batteries Included: As noted in last month's "News & Products" (page 117), Batteries Included has introduced an extensive array of new products for a variety of computers. Among the new titles you'll be seeing will be the *PaperClip II* word processor (\$79.95) and the *HomePak* three-in-one telecommunications-word processor-data manager (\$49.95), both for the Commodore 128; the *PaperClip* word processor for the Apple II/II+/III/IIIc computers (\$59.95); *PaperClip* with *SpellPak* spelling checker for the Atari 130XE (\$59.95); and five new productivity packages for the IBM PC and compatibles, including the advanced *PaperClip Elite* word processor (\$129.95) and *Degas Elite* graphics program (\$79.95), among others. (Batteries Included, 30 Mural St., Richmond Hill, Ontario, Canada L4B 1B5.)

Spinnaker: This software publisher introduced *A.C.E.*, a combat simulator for the Commodore 64. This game combines a flight simulator with arcade-game-style combat. It features multiple weapons systems, an on-board computer, overhead satellite mapping, and 3-D action (\$19.95). (Spinnaker Software, One Kendall Sq., Cambridge, MA 02139.)

Bodylog: Bodylog has developed a new multipurpose peripheral called Bodylink, which plugs into the cartridge slot of a Commodore 64/128 and turns the computer into an exercise machine, stress reduction device, and personal computerized biofeedback loop. Once you've purchased a package that contains the main Bodylink hardware, you can buy add-on software packages for whatever applications you're interested in. Prices for starter kits range from \$139.95 to \$209.95; additional hardware and software packages for a wide variety of applications cost between \$29.95 and \$99.95. (Bodylog, 34 Maple Ave., Armonk, NY 10504.)

Timeworks: Timeworks announced that its Commodore 128-specific programs, *Word Writer 128*, *Swiftcalc 128*, *Data Manager 128*, and *Sylvia Porter's Personal Financial Planner 128*, will continue to be upgraded on a regular basis. The publisher has also added a thesaurus to *Word Writer 128*. (Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015.)

Brøderbund Software: Several new products representing a diverse line of software were introduced by Brøderbund. Among them were *The Toy Shop*, available for the Apple II series and Commodore 64, which lets the user make 20 working mechanical models and toys. Users can customize their toys, print out the designs on paper, and attach them to adhesive cardboard. Wire, wooden dowels, adhesive cardboard, and other necessary supplies are included in the package, along with a comprehensive user manual. Suggested retail price for both versions is \$59.95. (Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903.)

For further information on new products announced at the Summer Consumer Electronics Show, please see the "News & Products" section. ©

16-Bit Explosion!

New Products For The Atari ST And Amiga

Tom R. Halfhill, Editor

As they enter their second year on the market, the Atari ST and Commodore Amiga are building up respectable software libraries spanning all the major categories of personal computing. At the same time, new peripherals and accessories are making the computers themselves even more powerful. Here's a look at the highlights of two recent computer industry trade shows: the Spring COMDEX in Atlanta and the Summer Consumer Electronics Show (CES) in Chicago. Many of these new products will be available this summer.

Atari ST

Atari was a major player at the Spring COMDEX and Summer Consumer Electronics Show (CES), filling its booths at both shows with dozens of cubicles sponsored by independent developers demonstrating their wares. The exhibits attracted thousands of browsers and potential new dealers. Perhaps more importantly, Atari continued to gain credibility—strengthening its image as a revitalized company on firm financial footing which is determined to become a significant force in the personal computer industry.

Atari's biggest announcements for the ST series included:

- An MS-DOS emulator that is supposed to run most of the big-name IBM PC software. (The prototype was running Microsoft's *Multiplan*.) The emulator is an external box which contains an 8088 microprocessor, a socket for an 8087 math coprocessor, and 512K of random access memory (RAM). When the emulator isn't operating, the ST can use the extra 512K as a RAM disk. Atari still hasn't decided whether to put a 5½-inch floppy disk drive in the box, so the final price is undetermined. Estimates are \$300 to \$400. Atari plans to begin selling the emulator this fall.

- A CP/M emulator implemented entirely in software. This comes on a 3½-inch disk and lets you run virtually any program written for the CP/M (Control Program/Microcomputers) operating system at 100 percent speed. No extra hardware is required. Already available in Europe, the CP/M emulator should be selling in the U.S. this summer for under \$50.

- A special summer price promotion that allows dealers to sell a 520ST, floppy disk drive, and monochrome monitor for \$599.

- Atari announced immediate availability of its 20-megabyte SH204 hard disk drive for \$799.95 and an Epson-compatible dot-matrix printer, the SMM804, for \$219.95. The printer can make accurate screen dumps of the ST's high-resolution (640 × 400-pixel)

screen mode. It prints at 80 characters per second and offers both friction and tractor feed.

- Atari has acquired rights to market an ST version of VersaSoft's *dBMAN*, a high-end relational database manager originally designed for the IBM PC and patterned after Ashton-Tate's *dBASE II* and *dBASE III*. According to Atari, experienced *dBASE* users can use *dBMAN* with no retraining. The suggested retail price is \$149.95, and Atari is encouraging dealers to give free evaluation copies to potential customers. The free copy is fully functional, but allows only 30 records per database.

In addition to these announcements, independent companies exhibited a flood of new software and hardware for the ST series, including some impressive business programs. With even more products due this fall, it's obvious that the ST will have a solid software library by the end of 1987.

So much software is being released that we don't have room here to cover it all; scan the "News & Products" section in this and future issues for further information. Following are some products that particularly caught our attention.

Batteries Included (Irvine, California) is emerging as one of the top software companies supporting the ST. Later this summer it plans

\$10,000.00

Atari ST Programming Contest!

First Prize \$5,000.00

Second Prize \$2,500.00

Third Prize \$1,000.00

Three Honorable Mentions \$500.00 each

COMPUTE! Publications, Inc. is looking for the very best original software for the Atari ST series computers. And to prove we're serious, we're offering a total of \$10,000.00 in prize money to the top six winners. That's \$5,000.00 for First Prize, \$2,500.00 for Second Prize, \$1,000.00 for Third Prize, and \$500.00 each for three Honorable Mentions. In addition, the winners will receive our standard royalties when their programs are published. And even if your program doesn't win a prize, you can still earn purchase fees and royalties if we accept your entry for publication.

Interested? If so, read these rules:

1. Entries must be your original work, previously unpublished. All those whose programs are accepted will be required to affirm this in writing.
2. You can submit as many entries as you want, but we cannot consider programs which have been entered in other contests or submitted for publication elsewhere at the same time.
3. The deadline is October 1, 1986. All entries must be received at our offices by this date. Programs submitted after this date will still be considered for publication, but will not be entered in the contest.
4. Entries are allowed (and encouraged) in virtually all software categories: home and business applications, education, recreation, telecommunications, graphics, sound and music utilities, and desk accessories.
5. Entries may be written in any programming language—including BASIC, Logo, C, machine language, Pascal, Modula-2, Forth, FORTRAN, and Prolog—as long as they meet two requirements. First, if you're using a compiled language, the compiled object or run-time code must be a self-standing program that can be run by someone who doesn't own a copy of the language. (Exceptions are ST BASIC and Logo. Since these languages come with the ST, it can be assumed that everyone owns a copy.) Second, we must be able to legally distribute the program without incurring licensing fees or other obligations to the maker of the language. If you're not sure whether a certain language qualifies, contact its maker for clarification.
6. Entries must be submitted on a single- or double-sided 3½-inch ST disk with both the run-time code and source code included.
7. Entries must be accompanied by an article which explains how to use the program, what it does, and so on. If your program employs any new or unusual techniques that you think will be of interest to other ST programmers, you can also describe how the program works.
8. Submissions which do not win a prize and are not accepted for publication will be returned only if accompanied by a self-addressed, stamped mailer.
9. All judging will be handled by the staff of COMPUTE! Publications, Inc. All decisions regarding contest entries and acceptances will be solely at the

discretion of COMPUTE! Publications, Inc., and all decisions are final. This includes decisions regarding creativity, similarity among entries, and so forth.

10. Winners will be announced by COMPUTE! Publications, Inc. in late 1986.

11. This contest is void where prohibited by law. Full-time, part-time & previous employees of COMPUTE! Publications, Inc., and Capital Cities/American Broadcasting Companies are ineligible for the contest, but may still submit work for publication at standard rates.

Every Contest Entry Must Contain This Form:

I warrant that the program presently entitled _____

_____ is my own original work and that the work has not been submitted for consideration elsewhere, nor has it been previously published. If my work is accepted by you, I understand that your decision as to the selection of winners and awarding of prizes is final and without recourse on my part. I agree, should you select my submission, to sign your standard contract, which includes assignment of the copyright of the program to COMPUTE!, and to allow you to use my name and image in promotional materials and other forms. (If you are under age eighteen, your parent or legal guardian must sign for you.)

Address entries to:

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COMPUTE! Publications, Inc.
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Announcing major news for Atari ST users:

COMPUTE!'s Atari ST

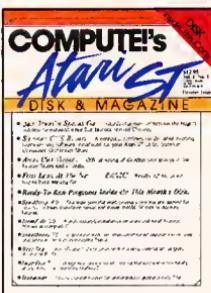
A bimonthly magazine devoted exclusively to Atari ST enthusiasts that includes a disk containing all of the programs found in each issue.

Atari has proven the pessimists wrong. The Atari 520ST and 1040ST have become the bestsellers among the new generation of personal computers. Both are breakthroughs in price and performance, and the community of ST owners is growing by thousands each month.

That's one reason why COMPUTE! Publications is announcing a new magazine specially designed for ST users. At the same time, we recognize that the power of the ST presents a unique challenge to magazines which publish program listings. That's why we're including a 3½-inch disk that contains every program found in each issue—ready to load and run. No more typing!

Here's what you'll get in every issue of COMPUTE!'s Atari ST Disk & Magazine:

- **Top-quality programs.** Utilities. Games. Educational programs for youngsters. Application programs for home and business. And since all the programs will be on disk, there are few limitations on length or languages. A typical disk might contain an elaborate adventure game written in BASIC, a programming utility written in machine language, a dazzling graphics demo in compiled Pascal, and a useful home or business application written in Forth or C.
- **Neochrome of the Month.** Take a look at what computer artists are doing with the Atari ST. Each issue's disk contains a Neochrome picture file ready for you to load and admire. Are you an artist yourself? Send us a picture of your own, and we'll pay you if it's published.
- **Regular columns.** If you're a programmer—or would like to be—you'll love our columns on ST programming techniques and the C language. Or check out our column on the latest events and happenings throughout the ST community. Or send your questions and helpful hints to our Reader's Feedback column.
- **Reviews.** Honest evaluations of the latest software and hardware for the Atari ST.
- **News & Products.** A comprehensive listing of the newest releases for your ST.



- **And more:** Interviews with ST newsmakers, reports on the latest industry trade shows, and overviews of significant new product introductions.

Starting with the October issue (available September 1), **COMPUTE!'s Atari ST Disk & Magazine** will be found on newsstands nationwide for only \$12.95 per copy, including disk. Or it can be delivered directly to your mailbox six times a year for only \$59.95—a savings of over 20 percent.

As a special bonus, if you order a prepaid subscription before August 1, you'll get the first issue absolutely free!

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to release a follow-up to its popular *Degas* drawing program: *Degas Elite*. New features include ten levels of magnification; the ability to load a picture created in any resolution into any other screen mode (including monochrome to color and vice versa); the ability to load pictures created with an Atari 400/800/XL/XE and KoalaPad or Atari Touch Tablet; up to eight screens in memory at once, with block-copying between screens; adjustable color cycling for animation effects; automatic color blending across the selected color palette; and the ability to grab any portion of a screen and use it as a paintbrush. *Degas Elite* will sell for \$79.95.

Thunder! has already started shipping a program called *Thunder!*, a realtime spelling checker. *Thunder!* installs as a desk accessory and loads a 50,000-word dictionary into memory and, using a special compaction technique, takes up only about 80K of RAM. It works in realtime with any program that supports GEM—including word processors, terminal programs, text editors, and notepads. When you type a word that *Thunder!* cannot find in its dictionary, it beeps to let you know. By pressing a key or selecting a menu item, you can pop open a window that displays a number of words that *Thunder!* thinks you were trying to spell. If you find the correct word in the list and click on it with the mouse, *Thunder!* automatically substitutes the correct spelling, closes the window, and lets you resume typing. If you find realtime spell-checking annoying, *Thunder!* also lets you check an entire document after it's created or check documents created with text editors that don't support GEM. Numerous other features allow you to add your own words to the main dictionary, compile supplementary dictionaries on disk, and analyze your text for readability. *Thunder!* sells for \$39.95.

Abacus Software (Grand Rapids, Michigan) announced several new programs: *ST TextPro*, a word processor with mouse and keyboard commands, multicolumn and sideways printing, user-definable function keys, automatic indexing, and table-of-contents generation; *ST Text Designer*, a page-making package for creating layouts from

text files; *ST DataPro*, a database manager that allows up to 64,000 records of unlimited length; *ST Forth/MT*, a multitasking Forth with more than 1500 commands and 32-bit arithmetic; *ST PaintPro*, a GEM-based design program; and *ST AssemPro*, a 68000 macro assembler and debugger with text editor. All these programs sell for \$49.95, except *ST AssemPro*, which sells for \$59.95.

The software company which wrote *1st Word* for Atari—GST of Cambridge, England—is exporting several programs to the U.S., including *1st Word Plus*. Among other things, this enhanced word processor lets you merge *Neochrome* or *Degas* pictures into documents. Current plans call for Atari to market *1st Word Plus*, but GST will be selling its other programs independently. These include *GSTC Compiler*, a GEM development package for the C language; *GST-ASM*, a 68000 macro assembler; *GEM Screen Editor*, a text editor; and *GST Linker*, for compiling runtime code from source libraries. *GEM Screen Editor* and *GST Linker* are included with *GSTC Compiler* and *GST-ASM*. Prices were not available at press time.

Avila Associates (Lafayette, California) is bringing out an animation program called *Make It Move*. By pointing and clicking on icons representing different functions, you can write a script for animating shapes, text, and other graphics. It's compatible with all of the popular drawing programs and offers such functions as zooms, fades, and spins. Price: \$49.95. Another Avila product is *Casino Craps*, a complete craps simulation: \$39.95.

Desk accessories are proving to be as popular on the ST as they are on the Macintosh and IBM. Two of the most complete business-oriented accessories we've seen are from Blue Moon Software (Lenexa, Kansas). *MacroDesk* contains an 18-function calculator with ten memories that works in either algebraic or reverse-Polish notation; an alarm clock/calendar that helps you keep track of events far into the future; a filer with search, print, and phone-dialing functions; and an event log that's somewhat like a diary for jotting down important

contacts and events. *MacroManager* has all the features of *MacroDesk* plus a project-scheduling worksheet and a log for project time recording and analysis. *MacroDesk* sells for \$39.95 and *MacroManager* for \$69.95; both are available now.

Musicians will be interested in new software from Hybrid Arts (Los Angeles). *DX-Droid* and *Oasis* take advantage of the ST's high-resolution graphics and built-in MIDI (Musical Instrument Digital Interface) ports. *DX-Droid* is a multi-featured patch editor which can even generate banks of new sounds on its own (for the Yamaha DX- and TX-series synthesizers). *Oasis* is a full-featured sampling wave-table editor and librarian for the Ensoniq Mirage. *DX-Droid* is available now for \$244.44; *Oasis* should be available soon and will cost about the same as the Atari 130XE version (\$187.87).

MichTron (Pontiac, Michigan) released a number of new products including *ALT*, which permits you to assign strings of up to 60 characters to each of the 36 Alternate-key combinations (\$29.95); *The Animator*, a graphics-animation utility (\$39.95); *BBS 2.0*, a revised version of MichTron's earlier Bulletin Board System (\$79.95); *Cornerman*, a desk accessory with notepad, calculator, address book/dialer, character-code chart, clock, and a game (\$49.95); *Echo*, which lets you plug in X-10 modules for controlling home appliances (\$39.95); *Mighty Mail*, a mailing list manager and phone book (\$49.95); and two arcade-style games, *Major Motion* and *Mission Mouse* (\$39.95 each).

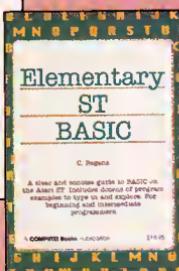
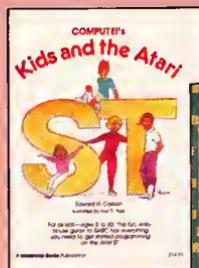
If you like to write your own software and want to go beyond ST BASIC and DR Logo, a few new languages are being released for the ST this summer. Softworks Limited (Chicago) is bringing out *Softworks BASIC*, a compiler that offers advanced features such as data structures like those found in C and Pascal. The XCALL statement can access machine language routines, and the TOOLBOX command lets you call most of the graphics and sound functions built into the ST's operating system. Price: \$79.

Prospero Software Limited (London) is exporting *Pro FORTRAN-77* and *Pro Pascal*, two high-

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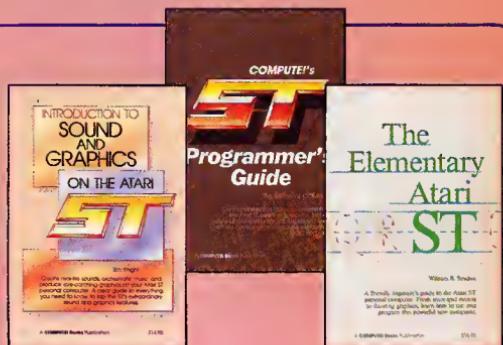
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level compilers. Both languages have 7- and 16-digit precision floating-point math, four-byte integers, and the ability to access GEM routines. Each costs \$149. (The U.S. distributor is Apex Resources, Brookline, Massachusetts.)

TDI Software (Dallas) has released two new versions of its Modula-2 compiler, including a special developer's version with directory search paths, a symbolic debugger, new modules, an intelligent linker, an enhanced text editor, and improved documentation on GEM. The regular version is \$79.95, and the developer's version is \$149.95. Upgrades for current owners are available at less cost.

Several companies are releasing significant small-business software for the ST. Timeworks (Deerfield, Illinois) is introducing *Word Writer ST*, a word processor with an 85,000-word spelling checker and thesaurus, outlining, macro keys, and GEM interface; *SwiftCalc ST*, a spreadsheet program which can translate data into pie charts, bar charts, scattered diagrams, line graphs, and 3-D staggered bar charts, plus sideways printing for wide spreadsheets; and *Data Manager ST*, a database manager with graphics and functions for generating labels and reports. All three programs are integrated with each other and sell for \$89.95 each.

Sierra On-Line (Mountain View, California) is releasing a small-business accounting package called *ST OneWrite*. It automatically posts ledgers and prints out checks on standard business forms. Price: \$129.95. Oxxi (Long Beach, California) is introducing *abOne*, a database manager that is compatible with *dBASE II* files. Price: \$99. And Dac Software (Dallas) is translating two of its popular IBM PC packages for the ST: *Dac-Easy Accounting* (\$69.95) and *Dac-Easy Payroll* (\$49.95).

A variety of games are coming out for the ST this summer, and although many are translations from versions previously available on other computers, some are brand-new.

Activision (Mountain View, California) is introducing *Hacker II: The Doomsday Papers*, a sequel to

the popular *Hacker* (\$49.95), and *The Activision Little Computer People Discovery Kit*, which simulates living creatures inside your computer. *Little Computer People* is already available on other machines. Another Activision product—which isn't a game—is *Paintworks*, a graphics-design program. (Originally known as *N-Vision*, *Paintworks* was written for Activision by Audio Light.) One feature that sets *Paintworks* apart from all other drawing programs on the ST is that you can design a picture taller than the screen—as large as an 8½ × 11-inch page, in fact. You can scroll the picture vertically and make a full-size hardcopy with an appropriate color printer, such as the OkiMate 20. Price: \$69.95.

The Avalon Hill Game Company (Baltimore) is releasing *Spitfire 40*, an authentic flight simulator that puts you in the cockpit of a Royal Air Force fighter plane during the Battle of Britain. It even recreates the fuel pump problems experienced by Mark I Spitfires while diving. Price: \$35. Avalon Hill also is working on a football simulation due for release later this year.

Cosmi (Wilmington, California) is completely rewriting its *Super Huey Helicopter Flight Simulator* for the ST to take advantage of the computer's enhanced graphics. Price: \$39.95. And Microprose (Hunt Valley, Maryland) is doing likewise with *Silent Service*, its much-praised World War II submarine simulation. Microprose also hinted that two more of its simulations will be rewritten for the ST later this year.

Infocom (Cambridge, Massachusetts), which recently merged with Activision, introduced a few new works of text-only interactive fiction for \$39.95 each. (They're also available for the Amiga and several other machines.) *Trinity* places you in London just as World War III begins. As The Bomb begins exploding overhead, you enter a mysterious portal that lets you visit the time and place of every nuclear device ever detonated, including the first Trinity test in New Mexico in 1945. Is there anything you can do to change the future?

Moonmist, Infocom's second entry, is modeled after gothic mys-

tery novels. You're sent on a journey to a castle in England, where you become involved in a search for hidden treasure. Along the way you must deal with local superstitions and ghosts.

Commodore Amiga

After missing the Fall COMDEX and Winter CES—to the distress of its fans—Commodore made a big showing with the Amiga at the Spring COMDEX in Atlanta. However, a few weeks later, Commodore significantly scaled down its appearance at the Summer CES. Instead of going ahead with plans for a large exhibit on the main floor, Commodore switched to a small meeting room on an upper floor—the same meeting room occupied by Atari a year ago. Even more disappointing, the Amiga was nowhere to be seen. Commodore explained that it considers the Amiga to be a high-end personal/business computer, not a consumer computer, and therefore it came to CES with only the Commodore 128 and redesigned 64.

Nevertheless, several other companies introduced Amiga software at CES, and the big news at COMDEX was Commodore's announcement of a new IBM PC emulator—the Sidecar. The Sidecar is a plug-in expansion box, not to be confused with the currently available PC emulator, the *Transformer*. The *Transformer* emulates the PC entirely in software; the only hardware required is a 5½-inch floppy disk drive. When the *Transformer* was finally released this spring after numerous delays, it became obvious that another solution would have to be found to make the Amiga truly IBM-compatible. The *Transformer* proved to be less compatible than its designers had hoped and was widely criticized for its slow execution speed.

As a result, Commodore decided to take the more conventional hardware approach to emulation. The Sidecar is basically an IBM PC without a keyboard. It's a large box that plugs into the expansion port, and it contains an 8088 microprocessor, an empty socket for an 8087 math coprocessor, 256K of RAM (expandable to 512K), a 5½-inch disk drive, and three empty slots compatible with PC expansion

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boards. A second floppy drive or 20-megabyte hard disk is optional, and there's also provision for up to two megabytes of Amiga memory expansion.

When the Sidecar is booted, two new icons labeled *PC Mono* and *PC Color* appear on the Amiga's Workbench screen. The Sidecar is designed to emulate the PC's monochrome and color/graphics modes, and clicking on one of these icons selects which mode to use. PC-DOS then opens up as a window on the Amiga Workbench screen. To the Amiga's multitasking operating system, the PC emulator is simply another task—so you can simultaneously run one or more Amiga programs while using the emulator. You can even open more than one PC window at once, if enough memory is available. You can't, however, multitask PC programs, since PC-DOS isn't a multitasking operating system.

Commodore says that this marriage of the PC and Amiga creates some interesting possibilities. For instance, you can plug a hard-disk expansion card into one of the Sidecar's slots and partition the disk for use with AmigaDOS as well as with PC-DOS. Amiga and PC software can run concurrently and exchange data using a common memory area. And although PC graphics are limited to four simultaneous screen colors as on a real IBM, you can select those four colors from the Amiga's much larger palette of 4096 colors.

The technology for the Sidecar originates from the two IBM PC clones which Commodore sells in Europe—the PC-10 and PC-20. (Commodore was going to introduce these machines into the U.S. market at Summer CES, but canceled its plans at the last minute.) Unlike the *Transformer*, the Sidecar is supposed to be nearly 100 percent IBM-compatible and capable of running programs at the full speed of a regular PC. At COMDEX, we saw the Sidecar running Microsoft's *Flight Simulator*, one of the toughest tests for any PC clone.

Scheduled for release this fall, the Sidecar is going to be priced relatively low. Although Commodore has not officially announced a price yet, indications are that it will cost \$300 to \$500.

Another interesting Amiga peripheral shown at COMDEX was the FutureSound digital sound recorder from Applied Visions (Medford, Massachusetts). The package comes with a digitizer, microphone, recording software, and a cable that plugs into the parallel printer port. A phono jack on the digitizer allows you to bypass the microphone for direct recording or to mix two different sound sources. Any sound can be recorded and played back at any speed, and recorded sounds can also be played by your own programs written in C or Amiga BASIC. The sampling rate can be varied from a few samples per second to 28,000 samples per second (the higher the rate, the greater the quality—and the more memory required). Price: \$175.

An Amiga expansion box was announced by The Gemstone Group (Buffalo Grove, Illinois). Current plans call for eight expansion slots, 512K of RAM (expandable to eight megabytes), a hard disk interface, and a realtime clock with battery backup. The Gemstone Group also is considering a CD-ROM interface and MIDI ports as additional standard features. The box is scheduled for release late this summer for \$995. A version with eight megabytes of RAM installed is tentatively priced at \$1,995.

Golden Hawk Technology (Nashua, New Hampshire) announced a MIDI interface with in/out jacks and a synchronization connector for controlling drum machines and other devices. It hooks up to the serial port and is priced at \$79.95.

Amiga musicians will also be interested in *SoundScape Pro*, a MIDI sequencer system from Mimetics Corporation (Palo Alto, California). *SoundScape Pro* uses the Amiga's multitasking operating system to make multiple music programs behave like separate pieces of studio equipment, all tied together through a software patch panel. It provides the equivalent of a MIDI clock generator, a sampling synthesizer, and a digital tape deck. The price is \$149. Mimetics also is releasing the *SoundScape Digital Sampler* for \$99 and a MIDI interface for \$49.

Flow, an idea processor from New Horizons Software (Austin, Texas), is designed to help you create and organize presentations, reports, projects, and events. It takes advantage of the Intuition user interface, but also provides keyboard shortcuts. Price: \$99.95.

Byte by Byte (Austin, Texas) announced two Amiga programs: *InfoMinder*, a hierarchical database manager, and *Write Hand*, a word processor. *InfoMinder* is unique in that it lets you combine text and graphics, and it also can be used to program custom applications. Price: \$89.95. *Write Hand* has online help screens and is designed to make it easy for small businesses to generate form letters. Price: \$50.

Electronic Arts announced several programs to be available this summer, including *Chessmaster 2000* (\$44.95); *DeluxePaint Art & Utility Disk #1*, a supplement to the popular *DeluxePaint* (\$29.95); *DeluxePrint Art Disk #2*, a supplement to *DeluxePrint* (\$29.95); *DeluxeVideo*, the long-awaited presentation graphics program (\$99.95); *Instant Music*, a composition tool for non-musicians (\$49.95); *Marble Madness*, an arcade-style game (\$49.95); and *Ultima III*, an adventure game (\$59.95).

Access Software (Woods Cross, Utah) is introducing its hit golf simulator, *Leader Board*, for the Amiga. As realistic as this program is on the Commodore 64—with 3-D animation, true perspective view, detailed landscapes, and lifelike sounds—it should be even better on the Amiga. The price is \$39.95.

Master Designer Software, in cooperation with Mindscape, (Northbrook, Illinois), is bringing out a series of five new games for the Amiga in late 1986/early 1987 under the Cinemaware label. These games are described as interactive movies that combine classic movie themes with sophisticated computer graphics. All are role-playing games, and the graphics imitate film effects such as 3-D movement, zooms, cuts, pans, close-ups, and changes in perspective. The titles scheduled so far include *Sinbad and the Throne of the Falcon*, *The King of Chicago*, *S.D.I.*, *Defender of the Crown*, and *Star Rush*. They'll also be available on the Atari ST and Apple Macintosh. ©



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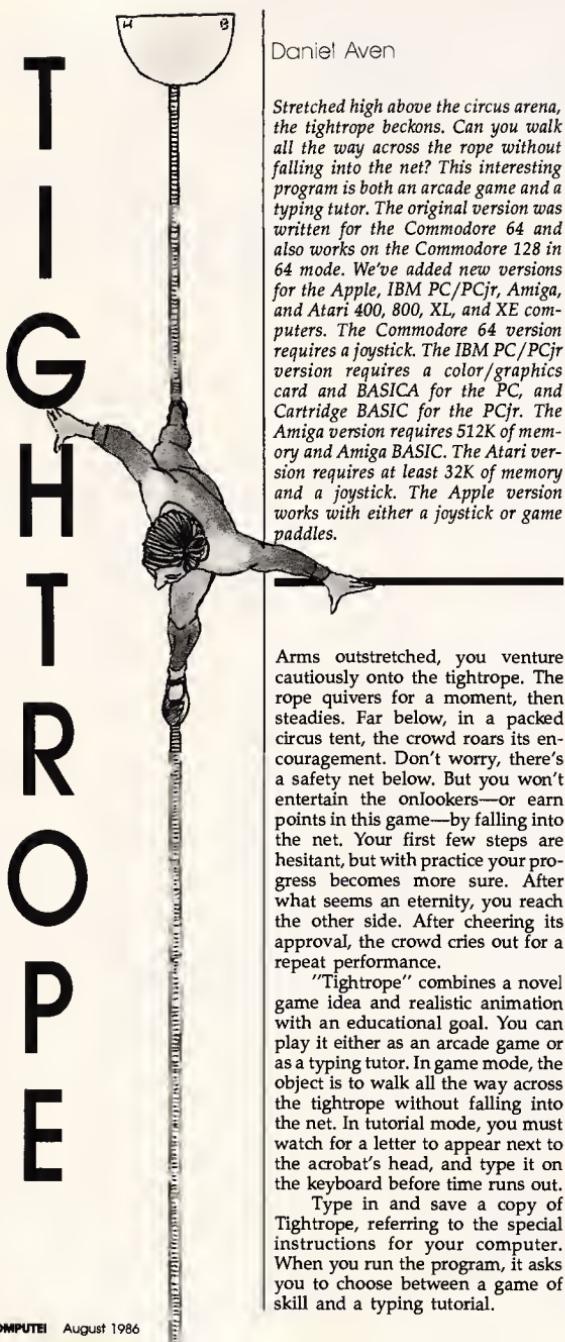
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Daniel Aven

Stretched high above the circus arena, the tightrope beckons. Can you walk all the way across the rope without falling into the net? This interesting program is both an arcade game and a typing tutor. The original version was written for the Commodore 64 and also works on the Commodore 128 in 64 mode. We've added new versions for the Apple, IBM PC/PCjr, Amiga, and Atari 400, 800, XL, and XE computers. The Commodore 64 version requires a joystick. The IBM PC/PCjr version requires a color/graphics card and BASIC A for the PC, and Cartridge BASIC for the PCjr. The Amiga version requires 512K of memory and Amiga BASIC. The Atari version requires at least 32K of memory and a joystick. The Apple version works with either a joystick or game paddles.

Arms outstretched, you venture cautiously onto the tightrope. The rope quivers for a moment, then steadies. Far below, in a packed circus tent, the crowd roars its encouragement. Don't worry, there's a safety net below. But you won't entertain the onlookers—or earn points in this game—by falling into the net. Your first few steps are hesitant, but with practice your progress becomes more sure. After what seems an eternity, you reach the other side. After cheering its approval, the crowd cries out for a repeat performance.

"Tightrope" combines a novel game idea and realistic animation with an educational goal. You can play it either as an arcade game or as a typing tutor. In game mode, the object is to walk all the way across the tightrope without falling into the net. In tutorial mode, you must watch for a letter to appear next to the acrobat's head, and type it on the keyboard before time runs out.

Type in and save a copy of Tightrope, referring to the special instructions for your computer. When you run the program, it asks you to choose between a game of skill and a typing tutorial.

A Delicate Balance

If you choose the game of skill, your goal is simple: Move the animated acrobat all the way across the tightrope without falling into the net. As the acrobat walks along, you'll occasionally begin to fall to one side or the other. But there's always time to recover your balance by pushing the joystick (or keyboard controls in some versions) in the opposite direction of the fall. If you countermove just enough to regain your balance, all is well and the acrobat begins to walk again. If you move too far in the opposite direction, the teetering starts all over again.

It's a delicate balancing act, and it grows more difficult each time you make it across the rope. When you succeed in reaching the opposite side, you advance to the next skill level. At each higher level, it becomes more and more difficult to keep your balance.

If you lose your balance completely, the acrobat falls to the safety net and bounces a few times before coming to rest. At this point you can try again at the same level or return to the main menu to choose a different game.

Your score is based on how far you get before falling. Each successful step is worth a certain number of points, and this value increases at higher levels. In addition, bonus points are awarded for rapid progress; the faster you move across the rope, the higher the bonus.

Typing Tutor

In the tutorial version of Tightrope, the object is the same—move the acrobat across the rope without falling—but different means are used to keep your balance.

When you see a character appear next to the acrobat's head, that's your cue to press the corresponding key on the keyboard. If you type the correct letter, the acrobat straightens up. If you press the wrong key, a buzzer sounds and the acrobat teeters even more.

To remain on the rope, you must continue to type the same letters that appear on the screen. In other respects, the tutorial version of Tightrope is the same as the skill game.

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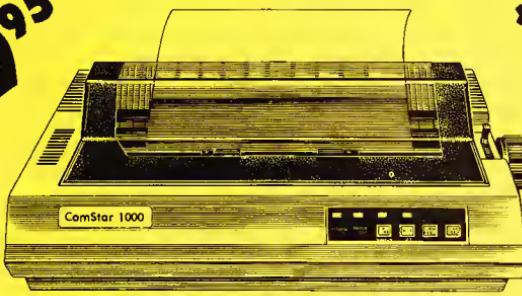
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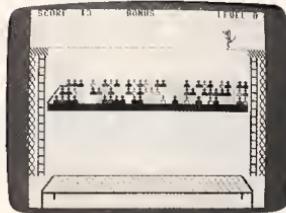
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"Tightrope" for the Commodore 64, an amusing and educational game.

Commodore 64/128 Version

This version of Tightrope requires a joystick plugged into port 2. After you finish walking across the rope, you must repeat the performance while riding a unicycle. At successive skill levels, the acrobat alternates between walking and riding the unicycle.

Atari Version

Tightrope for the Atari requires a joystick plugged into port 1 and at least 32K of Random Access Memory (RAM). Move the joystick right or left to balance the acrobat.

IBM PC/PCjr Version

This version of Tightrope requires a color/graphics card and BASICA for the PC, or Cartridge BASIC for the PCjr. Play the game with keyboard controls: Press the Z key to move left (your left, not the acrobat's), and the slash (/) key to move right.

Amiga Version

Tightrope for the Amiga requires at least 512K of RAM. When typing the program listed below, do not type in the left-arrow symbol at the end of each line; it's there only to show you where the line ends (we deliberately chose a character that's not available from the Amiga's keyboard). Instead, wherever you see a left-arrow in the Amiga listing, press RETURN.

The Amiga game uses the same keyboard controls as the IBM PC/PCjr version: Press Z to move left and the slash (/) key to move right.

Apple II Version

The Apple version of Tightrope works with either a joystick or game paddles and runs on any Apple II-series computer with either ProDOS or DOS 3.3.

For instructions on entering these listings, please refer to "COMPUTER's Guide to Typing In Programs" in this issue of COMPUTER.

Program 1: Commodore 64/128 Tightrope

```

RM 10 U1=54296:U2=54277:U3=542
78:U4=54276:U5=54273:U6=
54272
CQ 20 M1S="E1"+CHR$(8)+"E3"<
+CHR$(3)+"E2XJ"+CHR$(16)
+CHR$(248)+"LEB8T3":PO
KE835,0
MJ 30 POKE836,208:POKE830,0:PO
KE831,216:POKE828,0:POKE
829,64:POKE56334,0
GK 40 POKE1,51:ML$=ML$+SYS(PEE
K(51)+256*PEEK(52)):POKE
1,55:POKE56334,1
MJ 50 POKE53272,30:FORA=14336T
014343:READB:POKEA,B:NEX
T:FORA=0TO6:READC(A):NEX
T
PH 60 GOTO80:DATA24,60,60,24,1
26,255,255,255,7,0,1,3,5
,2,4
MR 70 FORA=1TOX:POKE646,C(RND(
1)*7):PRINT"0":NEXT:PRI
NT:RETURN
QE 80 PRINT"(CLR)[PUR]":POKE5
3280,4:POKE53281,1
FB 90 PRINT"(CLR)[9 DOWN]"SPC(
15)"1- GAME"
KS 100 PRINT"(2 DOWN)"SPC(15)"
2-TYPEING
AP 110 GETAS:IFAS<>"1"ANDAS<>"
2"THEN110
SM 120 W=VAL(AS)
PA 130 DATA0,0,0,0,0,0,0,56,0,
0,92,0,252,0,0,92,0,1
28,56,8,127,255,240,0,1
68
PH 140 DATA0,0,216,0,0,248,0,0
,136,0,0,248,0,0,248,0
,0,248,0,0,248,0,1,192,0
XG 150 DATA0,224,0,0,176,0,0,1
52,0,1,176,0
SB 160 DATA1,240,0,3,176,0,1,2
00,0,0,112
RS 170 DATA0,0,48,0,0,48,0,0,9
6,0
HS 180 DATA1,240,0,1,240,0,3,1
76,0,3,48,0,1,176,0,0,1
52,0,1,176,0
FG 190 PRINT"(3 DOWN)
[5 SPACES]ENTER LEVEL 0
F DIFFICULTY 0-9
CS 200 GETAS:IFAS<>"THEN200
DH 210 IFAS<>"0 ORAS"9"THEN200
QX 220 B=VAL(AS):D=B:B=10-B
SF 230 P1=206:Y=69:PX=201:PZ=
205
RA 240 IFW=2THENB=B*8
PB 250 PRINT"(CLR)[RED]
[5 DOWN]E3+[BLK]
E3A T[RED]E3 +3";
ER 260 FORX=1TO15:PRINT"[GRN]V
[BLU]E[3][E3][GRN]V"
[BLU]E[3][E3][GRN]V":NEX
TX
GC 270 PRINT"[DOWN][2 UP]
[4 RIGHT][BLK]E32 0"
RH 280 PRINT"(3 RIGHT)N[YEL]VV
VVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVV[BLK]M"
EG 290 PRINT"(2 RIGHT)N[YEL]VV
VVVVVVVVVVVVVVVVVVVVVV
VVVVVVVV[BLK]M"
GJ 300 PRINT"(2 RIGHT)O[YEL]O

```

```

GR 750 IF F=1 THEN1120
FR 760 NEXTX
CB 770 C=C:T:T=0
JK 780 IFOA=1THENOA=0:Y2=69:GO
TO808
JS 790 OA=1:Y2=62
FC 800 IFO=9THENB=B-1:O=0+1
XF 810 IFW=2ANOO<9THENB=B-7
AS 820 IFO=9THENPX=200:PX=204
PG 830 GOT0150
QR 840 R=INT(R9*RNO(1))+1
EJ 850 IFR=2THENRETURN
GE 860 IFR=1THEN999
CC 870 P=197:POKE2040,P
BS 880 IFW=1THENGOSUB1930
OX 890 IFW=2THENGOSUB1730
KA 900 IFML=1THENJV=8
RR 910 IFML=2THENJV=4
SQ 920 IFJV=8THENP=P-1:POKE204
P,P:PIF=197THENRETURN
FB 930 IFJV=8THEN880
PE 940 P=P+1:POKE2040,P
PB 950 GOSUB1330
OH 960 PRINT"(HOME)"TAB(21)T
RS 970 IFFP=196ANOF<PXTHEN880
BR 980 F=1:RETURN
GB 990 P=261:POKE2040,P
EK 1000 IPW=1THENGOSUB1930
MX 1010 IFW=2THENGOSUB1730
CS 1020 IFML=1THENJV=4
AA 1030 IFML=2THENJV=8
MH 1040 IFJV=4THENP=P-1
QG 1050 GOSUB1330
BH 1060 PRINT"(HOME)"TAB(21)T
MQ 1070 IFFP<261THENP=196:RETURN
N
BO 1080 IFJV=47HENPOKE2040,P:I
OT01000
PX 1090 P=P+1:POKE2040,P
OQ 1100 IFFP<260ANDP<PXTHEN1000
JS 1110 F=1:RETURN
HO 1120 Z2=69:P=265:U7=200
OF 1130 POKEU1,15:POKEU2,0:POK
EU3,247:POKEU4,17
PJ 1140 FORZ=22TO297STEP8
QR 1150 U7=U7-8
RQ 1160 POKEU5,U7
BJ 1170 POKEV+1,Z
CA 1180 POKE2040,P:NEXTZ
PX 1190 22=22+3
JJ 1200 FORX=287TO22STEP-8
SX 1210 U7=U7+8
EB 1220 POKEU5,U7
RJ 1230 POKEV+1,X:POKE2040,P:N
EXTX
BC 1240 IFZ<236THEN1140
PF 1250 POKE54276,16
BF 1260 POKE53269,0:PRINT"
{DOWN}(7 RIGHT){YEL}PR
ESS {RVS}RETURN{OFF} T
O PLAY AGAIN"
FS 1270 PRINT"(DOWN) PRESS SPA
CE BAR OR PIREBUTTON F
OR MENU"
SS 1280 GETA$:JV=PEEK(56320):F
R=JVANO16
GH 1290 IF(A$=="OR(A$<>" "ANO
A$<>CHR$(13)))ANOFR<>T
HEN1280
SA 1300 C=0:IM1=0:AV=0:PX=201:P
Z=205:E=1
CF 1310 IFA$=CHR$(13)THEN250
BA 1320 OA=0:GOTO808
XA 1330 T3=3*INT(TI/60-T2):T=1
000-T3:IFT<0THENT=0
QF 1340 RETURN
RS 1350 OATA0,240,0,1,240,0,3,
176,0,3,48,0,3,48,0,2,
24,0,12,8,0
PG 1360 OATA0,120,0,0,248,0,1,
216,0,1,140,0,1,134,0,
0,131,0,3,130,0,0

```

```

JC 1370 DATA0,0,0,0,0,0,0,0,28,0,
64,46,0,48,126,0,28,4
6,7,24,0,1,254,0,0,8
7,128
AH 1380 OATA0,108,224,0,124,56
,0,68,4,0,124,0,0,124,
0,0,248,0,1,216,0,3,24
,0
CP 1390 DATA0,24,0,28,24,0,0,2
4,0,0,48,0,0
PC 1400 DATA0,0,0,0,0,0,32,24,
0,16,44,0,8,124,0,4,44
,0,3,16,0,1,252,0,0,17
4,0
AS 1410 DATA0,219,0,0,248,12B,
0,136,64,0,248,32,0,24
8,0,1,248,0,74,0,28,
4B,0
SD 1420 OATA112,24,0,128,48,0,
0,48,0,0,96,0,0
AQ 1430 OATA0,32,0,0,0,64,0,0,15
6,0,1,46,0,1,126,0,1,4
4,0,1,152,0,1,25,0,0,1
74,0
QK 1440 OATA0,219,0,0,184,128,
1,208,64,1,224,32,131,
240,0,0,255,240,0,0,48,0
GC 1450 OATA0,48,0,0,0,48,0,0,48
,0,0,48,0,0,96,0,0
GJ 1460 OATA0,0,0,0,16,0,0,39,
16,0,75,160,0,95,192,0
,75,128,0,127,128,64,5
4,0,96
CR 1470 DATA46,0,56,92,0,15,23
2,0,1,252,0,0,60,0,0,6
0,0,0,56,0,0,56,0,0,48
,0,0,48
GE 1480 DATA0,0,16,0,0,24,0,0,
4B,0,0
OM 1490 OATA0,0,0,0,0,0,0,112,
0,0,184,8,1,248,48,0,1
84,192,0,115,0,1,252,0
,0,168,0
ME 1500 OATA24,216,0,96,248,0,
128,136,0,0,248,0,0,24
8,0,0,248,0,0,216,0,0,
204,0
KG 1510 DATA0,198,0,0,195,0,0,
193,192,3,128,0,0
GK 1520 OATA0,0,0,0,0,16,0,112
,32,0,184,64,1,248,128
,0,185,0,0,114,0
AJ 1530 OATA1,252,0,2,168,0,4,
216,0,8,248,0,0,16,36,0,
96,248,0,0,248,0,0,248
,0
FC 1540 OATA0,204,0,0,198,0,0,
195,0,0,193,224,0,192,
192,3,128,0,0
OK 1550 OATA0,0,0,0,4,0,0,226,
0,1,113,0,3,241,0,1,11
3,0,0,226,0,1,252,0
CF 1560 DATA3,0,0,7,176,0,13,
240,0,B,144,0,16,240,0
,96,248,0,0,0,252,8
PB 1570 DATA0,287,240,0,192,0,
0,192,0,0,192,0,0,192,
0,1,128,0,0
EX 1580 OATA0,64,0,16,32,0,39,
176,0,37,208,0,47,208,
0,47,208,0,37,208,64
CA 1590 DATA19,144,48,8,240,32
,7,208,96,3,176,192,0,
243,128,0,158,0,0,252,
HB 1600 DATA0,240,0,1,128,0,1,
128,0,1,128,0,0,192,0,
0,192,0,1,0,0,0
JE 1610 OATA0,0,128,0,0,136,4,
1,152,4,67,48,4,67,96,
4,71,96,4,199,96
BA 1620 OATA36,135,96,123,135,
96,181,135,96,255,255

```

```

224,119,247,224,3,255,
192

```

```

AG 1630 OATA0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0

```

```

CC 1640 T4=INT(TT/60)

```

```

CS 1650 GETA$:IFAS=""THEN1650

```

```

CA 1660 T5=INT(TT/60)

```

```

KB 1670 T2-T2+T5-T4:RETURN

```

```

QE 1680 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0

```

```

CD 1690 DATA2,2,0,1,4,0,0,248,
0,0,32,0,0,32,0,0,32,0
,0,32,0

```

```

OA 1700 DATA0,32,0,0,32,0,0,24
8,0,1,36,0,2,34,0,3,25
4,0,2,34,0,1,36,0

```

```

DQ 1710 DATA0,248,0

```

```

CX 1720 DATA1,140,0,2,82,0,0,2,3
4,0,2,82,0,1,140,0,0,2
48,0,0

```

```

RK 1730 R1=INT(25*RNO(1))+1

```

```

RS 1740 X9=INT(X/8)-4

```

```

KS 1750 R2=R1+64

```

```

JS 1760 A=0

```

```

KF 1770 PRINT"(HOME){2 DOWN}"T
AB(X9)CHR$(R2)

```

```

HC 1780 GETA$:A=1

```

```

PB 1790 IFA=0THENM1=2:GOSUB190
0:GOTO1830

```

```

FO 1800 IFAS=""THEN1780

```

```

SF 1810 IFAS=CHR$(R2)THENM1=1:
GOSUB1870:GOTO1830

```

```

SB 1820 M1=2:GOSUB1840

```

```

QC 1830 PRINT"(HOME){2 OWN}"T
AB(X9) " :RETURN

```

```

SJ 1840 POKEU1,15:POKEU2,45:PO
KEU3,165:POKEU4,33

```

```

AB 1850 POKEU5,6:POKEU6,5

```

```

XJ 1860 FORT=1TO200:NEXT:POKEU
4,32:POKEU5,0:POKEU6,0
:RETURN

```

```

QE 1870 POKEU1,15:POKEU2,0:POK
EU3,247:POKEU4,17

```

```

CX 1880 POKEU4,40:POKEU6,0

```

```

KF 1890 FORT=1TO100:NEXT:POKEU
4,16:RETURN

```

```

ME 1900 POKEU1,15:POKEU4,33:PO
KEU2,15

```

```

EH 1910 FORT=50TO5STEP-2:POKEU
5,16:POKEU6,7:TEXT

```

```

BB 1920 POKEU4,0:RETURN

```

```

SB 1930 JV=PEEK(56320)

```

```

SE 1940 GETA$:<AS><>"THEN1940

```

```

XS 1950 JV=15:(JVANO15)

```

```

SJ 1960 IFJV=40:JV=8THENAV=0:R
ETURN

```

```

AF 1970 AV+AV+1:IFAV*BTHENAV=0
:RETURN

```

```

GO 1980 GOTO1930

```

Program 2: Atari Tightrope

Version by Kevin Mykytyn, Editorial Programmer

```

II 10 POKE 106, 96:GRAPHICS 7
:C=0:GRAPHICS 0:POKE 7
52,1:POSITION 14,1,0:PR
INT "PLEASE WAIT"

```

```

OF 20 FOR A=30720 TO 31841:R

```

```

EAD B:C+C+B:POKE A,B:N

```

```

EXT A:IF C<>70649 THEN

```

```

PRINT "DATA ERROR":ST
OP

```

```

# 30 DIM P$(32),K$(1),A$(1)

```

```

:OPEN #4,4,"K:"

```

```

# 40 GRAPHICS 0:POKE 752,1:

```

```

POKE 716,15:POKE 709,0

```

```

:POSITION 14,9:PRINT "

```

```

(1) GAME":POSITION 14,

```

```

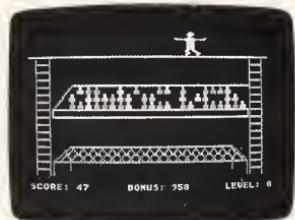
11:PRINT "(2) TYPING

```

```

# 50 GET #4,K:K$=CHR$(K):IF

```



"Tightrope" for Atari 400, 800, XL, andXE computers.

```

NEXT A:RETURN
AL 260 GDSUB 1120:T=TI/60
P8 270 PDKE 205,0:P=0:PDKE 2
0,205:PDKE 207,Y2:PO
KE 209,116:A=USR(3072
0)
FN 280 FDR X=155 TO 48 STEP
-1
J0 290 IF W=2 AND 0=B THEN B
=22
I6 300 IF W=2 AND 0=9 THEN B
=21
CC 310 C=C+1+D
08 320 GOSUB 1120:T3=3*(INT(
TI/60-T2)):T=1000-T3
NF 330 IF T<0 THEN T=0
D8 340 PDKE 656,1:PDKE 657,1
:PRINT "SCDRE1";:C1:P
DKE 657,16:PRINT "BDN
US";:T1";:POKE 657
,32:PRINT "LEVEL";:D
FP 350 PDKE 205,P:PDKE 206,X
EN 360 P=P+1:IF P>2 THEN P=0
H0 370 IF X<175 AND X>50 THE
N GDSUB 460
CN 380 IF PEEK(764)=33 THEN
GDSUB 910
OK 390 IF STICK(0)=7 THEN GO
SUB 490
N 400 IF STICK(0)=11 THEN G
DSUB 630
CH 410 NEXT X
N0 420 C=C+T:T=0
H1 430 IF D<9 THEN B=B-1:D=D
+1
HJ 440 IF W=2 AND D<9 THEN B
=B-3
BK 450 GDTD 260
LN 460 R=INT(29*RND(1))+1
PL 470 IF R>2 THEN RETURN
LD 480 IF R=1 THEN J30
N1 490 P=3:POKE 205,P
H0 500 IF W=1 THEN GOSUB 108
0
D1 510 IF W=2 THEN GOSUB 950
N1 520 IF M1=1 THEN JV=11
FN 530 IF M1=2 THEN JV=7
DE 540 IF JV=11 THEN P=P-1:P
DKE 205,P:IF P<3 THEN
RETURN
CH 550 IF JV=11 THEN 500
FN 560 P=P+1:POKE 205,P
JN 570 GOSUB 1120:T3=3*INT(T
1/60-T2):T=1000-T3
N1 580 IF T<1 THEN T=0
AR 590 POKE 656,1:PDKE 657,2
2:PRINT " ";T
LA 600 IF P>2 AND PCPX THEN
500
ED 610 POKE 205,12:GOSUB 760
H1 620 RETURN
N1 630 P=0:POKE 205,P
H0 640 IF W=1 THEN GOSUB 108
0
DN 650 IF W=2 THEN GOSUB 950
FK 660 IF M1=1 THEN JV=7
JH 670 IF M1=2 THEN JV=11
KL 680 IF JV=7 THEN P=P-1
PA 690 GOSUB 1120:T3=3*(INT(
TI/60-T2)):T=1000-T3
NH 700 IF T<1 THEN T=0
PK 710 POKE 656,1:POKE 657,2
2:PRINT " ";T
PE 720 IF P<8 THEN P=2:RETUR
N1 730 IF JV=7 THEN POKE 205
,P:POKE 640
FA 740 P=P+1:POKE 205,P
LW 750 IF P>2 AND P<PZ THEN
640
IN 760 Z2=44:P=12:U7=200
FI 770 FOR Z=Z2 TD 158 STEP
3
P0 780 SOUND 1,Z,10,15
M 790 POKE 205,P:PDKE 207,Z
:NEXT Z
H1 800 Z2=Z2+30
H0 810 FOR X=15B TD Z2 STEP
-3
PH 820 SDUND 1,X,10,15
DE 830 PDKE 207,X:PDKE 205,P
:NEXT X
FF 840 IF Z2<140 THEN 770
NC 850 SDUND 1,0,0,0:PDKE 65
6,2:PDKE 657,5:PRINT
" PRESS RETURN TD PL
AY AGAIN":POKE 764,25
5
OH 860 PRINT "PRESS SPACE BA
R OR F1REBUTTON FDR M
ENU";
BL 870 IF PEEK(764)=12 THEN
PDKE 206,0:E=1:AV=0:M
1=0:C=0:PX=201:PZ=205
:PRINT "(CLEAR)":GOTO
230
H1 880 IF PEEK(764)<>33 AND
STRIG(0)<>0 THEN B70
B1 890 POKE 206,0:E=1:C=0:M1
=0:AV=0:PX=201:PZ=205
D8 900 GDTD 40
H1 910 POKE 764,255:GOSUB 11
20:T4=INT(TI/60)
OP 920 GET #4,A
E0 930 GDSUB 1120:T5=INT(TI/
60)
H1 940 T2=T2+T5-T4:RETURN
D0 950 R1=INT((26*RND(1))+1
E0 960 X9=INT((X-4B)/4)
HE 970 R2=R1+32
EP 980 A=0
CH 990 POKE 764,255:K=255:PO
KE SCREEN+X9,R2
P1 1000 IF PEEK(764)<>255 TH
EN GET #4,K1=K-32
DM 1010 A=A+1:IF A=8 THEN M1
=2:GOSUB 1060:GOTO 1
050
H0 1020 IF K=255 THEN 1000
D1 1030 IF K=R2 THEN M1=1:GO
SUB 1070:GOTO 1050
D0 1040 M1=2:GOSUB 1060
OH 1050 POKE SCREEN+X9,0:RET
URN
L0 1060 FOR V=15 TO 0 STEP -
1:SOUND 1,200,10,V:N
EXT V:RETURN
JH 1070 FOR V=15 TO 0 STEP -
1:SOUND 1,60,10,V:NE
XT V:RETURN
KF 1080 JV=STICK(0)
JK 1090 IF JV=7 OR JV=11 THE
N AV=0:RETURN
LF 1100 AV=AV+1:IF AV=8 THEN
AV=0:RETURN
NF 1110 GOTO 10B0
JP 1120 TI=PEEK(16)*65536+PE
EK(19)*256+PEEK(28):
RETURN
CK 1130 DATA 169,0,133,186,1
65,299,133,187,162,3
,160,0,152,145,186,2
,00,200,251,230,187,2
,02,16,246,160,34,162
NP 1140 DATA 120,169,1,32,92
,228,104,96,216,169,
0,133,77,32,45,128,7
,98,228,165,206,141
,0,208,24,105
HM 1150 DATA 8,141,1,208,24,
105,8,141,2,208,165,
205,133,203,169,0,13
3,204,162,6,203,38
,204,202,240
HM 1160 DATA 17,224,3,208,24
5,165,203,141,184,12
,0,165,204,141,185,12
,0,76,72,120,165,283,
24,189,184,120,133,2

```

M 1170 DATA 165, 204, 189, 185
 , 120, 133, 204, 165, 203
 , 24, 185, 186, 141, 146,
 120, 165, 204, 185, 120,
 141, 147, 120, 165, 209,
 133, 204
 F 1180 DATA 169, 3, 133, 208, 1
 69, 0, 133, 203, 164, 207
 , 145, 283, 208, 162, 0, 1
 89, 255, 255, 145, 203, 2
 00, 232, 224, 24, 208, 24
 5
 H 1190 DATA 169, 0, 145, 203, 1
 73, 146, 129, 24, 105, 24
 , 141, 146, 120, 173, 147
 , 120, 185, 0, 141, 147, 1
 20, 230, 204, 198, 198, 2
 08
 CH 1200 DATA 287, 96, 0, 0, 0, 0,
 0, 0, 0, 96, 63, 0, 0, 0,
 0, 0, 0, 0, 0, 1, 1, 1,
 1
 E 1210 DATA 1, 3, 56, 60, 124, 5
 6, 48, 0, 124, 255, 254, 1
 24, 124, 124, 124, 124,
 24, 124, 124, 204, 134, 1
 34, 131, 131, 129, 3
 M 1220 DATA 0, 0, 0, 0, 0, 0, 0, 12,
 248, 0, 0, 0, 0, 0, 0, 0,
 0, 0
 P 1230 DATA 0, 0, 0, 0, 128, 0, 0
 , 0, 0, 0, 0, 96, 63, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0
 H 1240 DATA 0, 0, 0, 0, 56, 60, 1
 24, 56, 48, 0, 124, 255, 2
 54, 124, 124, 124, 124, I
 24, 124, 124, 124, 108, 1
 08, 198, 195, 97
 J 1250 DATA 96, 193, 0, 0, 0, 0,
 0, 0, 12, 248, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 128
 , 192, 128
 M 1260 DATA 0, 0, 0, 0, 0, 0, 0, 96,
 63, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 56, 60
 H 1270 DATA 124, 56, 48, 0, 124
 , 255, 254, 124, 124, 124
 , 124, 124, 124, 124, 124
 , 108, 120, 120, 60, 54, 2
 8, 48, 0, 0, 0, 0
 L 1280 DATA 0, 0, 12, 248, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0
 K 1290 DATA 0, 96, 63, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 56, 60, 124, 56, 48, 0
 , 127, 254
 O 1300 DATA 252, 124, 124, 124
 , 124, 124, 124, 124, 124
 , 108, 188, 198, 195, 97,
 97, 227, 0, 0, 0, 0, 0, 12,
 248, 0, 0, 0
 J 1310 DATA 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 128, 128, 0, 0,
 0, 0, 0, 0, 0, 1, 15, 56
 , 96
 M 1320 DATA 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 56, 60, 124, 5
 6, 48, 1
 O 1330 DATA 127, 254, 252, 124
 , 124, 124, 124, 124, 124
 , 124, 124, 188, 188, 198
 , 195, 97, 99, 192, 0, 0,
 12, 126, 192, 0, 0
 H 1340 DATA 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 128, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 1, 3
 B 1350 DATA 6, 12, 56, 60, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 56, 60
 , 124, 56, 48, 1, 127, 254
 , 252, 124, 124, 124
 F 1360 DATA 124, 124, 124, 124
 , 124, 188, 188, 284, 198
 , 99, 192, 192, 28, 288



IBM PC/PCjr version of "Tightrope."

Program 3: IBM PC/PCjr Tightrope

*Version by Patrick Parrish,
Programming Supervisor*

```

10 GOTO 120
20 PUT (X, Y), W3, PSET:RETURN
30 PUT (X, Y), W2, PSET:RETURN
40 PUT (X, Y), W1, PSET:RETURN
50 PUT (X, Y), L1, PSET:RETURN
60 PUT (X, Y), L2, PSET:RETURN
70 PUT (X, Y), L3, PSET:RETURN
80 PUT (X, Y), R1, PSET:RETURN
90 PUT (X, Y), R2, PSET:RETURN
100 PUT (X, Y), R3, PSET:RETURN
110 PUT (X, Y), W4, PSET:RETURN
120 KEY DFN:WIDTH 40:DEF SEG=0:PDKE 1047,PEEK(1047) DR
64:SEND 1:CDLDR 0:CLS
:LDCTATE 12, 15, 0:PRINT "PL
EASE WAIT":GDSUB 1038:GOT
D 240
130 JV=0:AS=INKEY$:IF JV=CHR$(47) THEN JV=1:AV=0:RETUR
N ELSE IF JV=CHR$(90) THE
N JV=2:AV=0:RETURN
140 AV=AV+1:IF AV=B$2 THEN AV
=0:RETURN
150 GDDT 130
160 RI=INT(26*RND(1)):I1:X9=IN
T(X9):R2=R1+64:A=0:LOCAT
E 3, X9:PRINT CHR$(R2)
170 A$=INKEY$:A=A+1:IF A=B TH
EN M1=GDSUB 1018:GOTU 2
180 IF A$="" THEN 170
190 IF A$=CHR$(R2) THEN M1=1:
GDSUB 1000:GDDT 210
200 M1=2:GDSUB 990
210 LDCTATE 3, X9:PRINT ":" RET
URN
220 T3=3*INT(TIMER-T2):T=1000
-T3*IF T<0 THEN T=0
230 RETURN
0H 240 RANDOMIZE TIMER:CLS:LOCAT
E 11, 15:PRINT "1- GAME", L
OCATE 13, 15:PRINT "2- TYP
ING"
250 A$=INKEY$:IF A$="" THEN 2
50
260 B=WVAL(A$):IF W1 DR W>2 T
HEN 250
270 LDCTATE 17, 5:PRINT "ENTER
LEVEL OF DIFFICULTY (0-9)
"
280 A$=INKEY$:IF A$="" DR
(A$ <>"0" OR A$ >"9") THEN 280
ELSE B=WVAL(A$)
290 B=B-10-B:IF W=1 THEN B=
B2
300 IF W=2 THEN B=B4B5
310 CLS:FOR X=0 TO 36 STEP 36
:FOR J=0 TO 25:PUT (X+8*J+8,
B, 48), B14=NOT J, X, LINE
(24, 48)-(-267, 18), 3
320 FDR J=0 TO 36 STEP 36:FOR
I=1 TO 15:PUT (J+8, 18+8*I,
$15, 15) PUT ($18+8*(J-35)+16,
18+8*(I-15), $16)NEXT I, J

```

```

FC 330 'LINE (40,74)-(837-1,74)
:LINE (39,75)-(837-1,75)
BF 340 FDR=R-1 TD 3-FDR C=6-R TD
36:X-(RND(1))=RDW=64+8*R:C
OL=C#8:IF X<3 THEN PUT(C
OL,ROW),S17:GDTD 380
IP 350 IF X>-3 AND X<6 THEN PU
T(CDL,ROW),S18:GDTD 380
BP 360 IF X>-6 AND X<9 THEN PU
T(CDL,ROW),S19:GDTD 380
BK 370 LDCTE ROW/B, COL/B:PRINT
" "
SJ 380 NEXT C,R
HN 390 LINE (39,75)-(17,96):LINE
(SB,75)-(16,96):FDR I=96
TD 96+7:LINE (16,I)-(83
7-1,I):NEXT I
FN 400 L1NE (23,20#B-1)-(36#B,20
#B-1):LINE (7,22#B)-(3#B,B
,22#B):LINE (23,20#B)-(7,
22#B):LINE (36#B,20#B-1)-(38#B,22#B)
KS 410 FDR R=0 TD 1:FOR C=3-R TD
35+R:PUT (C#B,(R+20#B)),
S15:NEXT C,R
IC 420 LINE (7,22#B)-(7,24#B):LI
NE (3#B,B,22#B)-(3#B,B,24#B
):LINE (23,22#B)-(23,23#B
):LINE (36#B,22#B)-(36#B,
23#B)
LN 430 Y=19:PX=7:PI=10:C=0
DJ 440 T2=TIMER
CB 450 IF W=2 AND D=8 THEN B=60
ELSE IF W=2 AND D=9 THEN
B=45
DL 460 P=0:GDSUB 1020:FOR X=2BB
TD 4 STEP -3
NL 470 C=D+1:GDSUB 220
FK 480 LDCTE 1,I:PRINT "SCDRE'C
" "TAB(16)"BONUS" T" "T
AB(31)"LEVEL" D
NC 490 F=0:IF X<268 AND X>24 THE
N GDSUB 620
SF 500 1F F=1 THEN B40
SF 510 P=1:IF P=5 THEN P=1
LZ 520 DN P GDSUB 20,30,40,30
IF 530 JV=0:A$=INKEY$:IF A$=" "
THEN GDSUB 960 ELSE IF A$=
=CHR$(47) THEN JV=1:GDSUB
640
HN 540 IF A$=CHR$(90) THEN JV=2:
GDSUB 730
CP 550 IF F=1 THEN B40
BZ 560 NEXT X:X=X+3:GDSUB 1020:G
DSUB 110
NN 570 C=C+1:T=0
K1 580 IF D>9 THEN B=8-B=D+1
DP 590 IF W=2 AND D<9 THEN B=2
5
KS 600 IF D=9 THEN PX=6:PI=9
FN 610 GDTD 440
JC 620 R=INT(9*RND(1))+1:IF R>2
THEN RETURN
BJ 630 IF R=1 THEN 730
BZ 640 P=4:PUT (X,Y),L1,PSET
FF 650 IF W=1 THEN GDSUB 130 ELS
E IF W=2 THEN GDSUB 160
QL 660 IF M=1 THEN JV=2 ELSE IF
M=2 THEN JV=1
BI 670 IF JV=2 THEN P=1:ON P G
DSUB 46,50,60,70:IF P<4
THEN RETURN ELSE 650
II 680 P=+1:ON P GDSUB ,,,50,60
,70
BC 690 GDSUB 220
HK 700 LDCTE 1,21:PRINT T
PD 710 IF P>3 AND P<PX THEN 650
E1 720 F=1:RETURN
JG 730 P=7:PUT (X,Y),R1,PSET
FE 740 IF W=1 THEN GDSUB 130 ELS
E IF W=2 THEN GDSUB 160
II 750 IF M=1 THEN JV=1 ELSE IF
M=2 THEN JV=2
IE 760 IF JV=1 THEN P=1-P
PF 770 GDSUB 220
IK 780 LOCATE 1,21:PRINT T
NS 790 IF P<7 THEN P=3:RETURN
NN 800 IF JV=1 THEN DN P GDSUB ,
,,,:80,,90,,100:GDTD 740
BN 810 P=P+1:DN P GDSUB ,,,,:80
,,90,,100
DE 820 IF P>6 AND P<PZ THEN 740
EL 830 F=1:RETURN
NN 840 P=10:PUT (X,Y),W4,PSET:RE
M FALLING MAN
KF 850 Z=23:FDL Z=Z2 TO 150 STE
P-6:IF Z>Z2 THEN PUT (X,Z
-6),812
NO 860 PUT (X,Z),S12:_SOUND (Z+15
):Z,812
PC 870 NEXT Z:PUT (X,Z-6),S12:Y=
Y+5#
NA 880 FDR I=150 TD Y STEP -6:IF
Z<150 THEN PUT (X,Z+6),S
13
BC 890 PUT (X,Z),S13:_SOUND (Z+15
):Z,813:1:NEXT Z:PUT (X,Z+6),
S13
EA 900 FOR Z=Y TD 150 STEP 6:IF
Z>Y THEN PUT (X,Z-6),813
L1 910 PUT (X,Z),S13:_SOUND (Z+15
):Z,813:1:NEXT Z:PUT (X,Z-6),
S13:Y=Y+30:IF Y<150 THEN
B80
DK 920 PUT (X,Z-6),S13:LDCTE 3,
6:PRINT "PRESS <RETURN> T
D PLAY AGA1N":LDCTE 4,7:
PRINT "PRESS <SPACE BAR>
FDR MENU"
NP 930 A$=INKEY$:IF A$<> " " AND
A$=>CHR$(31) THEN 930
LC 940 C=0:MI=0:AV=0:IF A$=CHR$(1
3) THEN 310
EE 950 GDTD 240
AB 960 T5=INT(TIMER)
FA 970 A$=INKEY$:IF A$=" " THEN 9
70
BB 980 T5=INT(TIMER):T2=T2+T5-T4
:RETURN
HK 990 BOUND 37,1:RETURN
LB 1000 SOUND 440,:1:RETURN
OL 1010 SOUND 2300,:1:RETURN
BL 1020 FDR DE=1 TD 400:NEXT:RET
URN
EN 1030 REM define shapes
FE 1040 DEFINT E,L,R,S,W
HO 1050 RESTDRE 1240:READ X,Y:E=
(4+INT((X+7)/8)*2):2:2:2:2:2:2
WI(E):WI(W)=WI(W1)=Y:IF
DR I=2 TO E REAAN A$=WI(I)
:VAL("SH"4+A$):NEXT
FB 1060 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(W2)=Y:IF DR I=2 TD E1R
EAD A$=WI(W2)=VAL("H"4+A$)
:NEXT
EE 1070 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(W3)=Y:FOR DR I=2 TO E1R
EAD A$=WI(W3)=VAL("H"4+A$)
:NEXT
NP 1080 E=(4+INT((4+27)/8)*21)/2
:DIM W4(E):WI(W4)=212:WI(W4(I
)=21):FOR DR I=2 TO E1R(I)=
0:NEXT
PB 1090 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(R1)=Y:IF DR I=2 TD E1R
EAD A$=WI(R1)=VAL("H"4+A$)
:NEXT
NO 1100 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(R2)=Y:IF DR I=2 TD E1R
EAD A$=WI(R2)=VAL("H"4+A$)
:NEXT
LB 1110 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(R3)=Y:IF DR I=2 TD E1R
EAD A$=WI(R3)=VAL("H"4+A$)
:NEXT
HE 1120 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(L1)=Y:IF DR I=2 TD E1R
EAD A$=WI(L1)=VAL("H"4+A$)
:NEXT
EC 1130 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(L2)=Y:IF DR I=2 TD E1R
EAD A$=WI(L2)=VAL("H"4+A$)
:NEXT
FA 1140 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(L3)=Y:IF DR I=2 TD E1R
EAD A$=WI(L3)=VAL("H"4+A$)
:NEXT
DC 1150 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S12)=Y:IF DR I=2 TD E1R
EAD A$=WI(S12)=VAL("H"4+A$)
:NEXT
DK 1160 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S13)=Y:IF DR I=2 TD E1R
EAD A$=WI(S13)=VAL("H"4+A$)
:NEXT
CC 1170 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S14)=Y:IF DR I=2 TD E1R
EAD A$=WI(S14)=VAL("H"4+A$)
:NEXT
DK 1180 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S15)=Y:IF DR I=2 TD E1R
EAD A$=WI(S15)=VAL("H"4+A$)
:NEXT
EC 1190 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S16)=Y:IF DR I=2 TD E1R
EAD A$=WI(S16)=VAL("H"4+A$)
:NEXT
DK 1200 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S17)=Y:IF DR I=2 TD E1R
EAD A$=WI(S17)=VAL("H"4+A$)
:NEXT
BB 1210 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S18)=Y:IF DR I=2 TD E1R
EAD A$=WI(S18)=VAL("H"4+A$)
:NEXT
DI 1220 READ X,Y:E=(4+INT((X+7)/
8)*2):2:2:2:2:2:2:2:2:2:2
WI(S19)=Y:IF DR I=2 TD E1R
EAD A$=WI(S19)=VAL("H"4+A$)
:NEXT
BB 1230 REM W1
PB 1240 DATA 48,21,0,0,0,B022,
0
HK 1250 DATA 0,B0AA,0,20,2A,B000
,A0,A
BN 1260 DATA B002,B,B02A,B,AA02,
AAAA,A0
LB 1270 DATA B0AA,0,0,B0AA,0,0,B
0AA,0
NB 1280 DATA 0,B0AA,0,0,B0AA,0,0
,B0AA
QJ 1290 DATA 0,0,B0A2,0,0,B0A2,0
,A0,A
HD 1300 DATA B0A2,0,0,B02A,0,0,B
0AA,0
FJ 1310 DATA 0,A002,0,0,B002,0,0
,B02A
KJ 1320 DATA 0,0
ND 1330 REM W2
PD 1340 DATA 48,21,0,0,0,B022,
0
HM 1350 DATA 0,B0AA,0,20,2A,B000
,A0,A
BD 1360 DATA B002,B,B02A,B,AA02,
AAAA,A0
LD 1370 DATA B0AA,0,0,B0AA,0,0,B
0AA,0
NB 1380 DATA 0,B0AA,0,0,B0AA,0,0
,B0AA
KJ 1390 DATA 0,0,B0A2,0,200,B0B2

```

,0,A00
 LB 1400 DATA B002,0,A00,B002,0,A
 00,B002,0
 CL 1410 DATA 200,0B00,0,200,2B00
 ,0,A00,A000
 KH 1420 DATA 0,0
 IA 1430 REM W3
 PF 1440 DATA 48,21,0,A,0,0,B022,
 0
 ND 1450 DATA 0,B0AA,0,20,2A,0B00
 ,A0,A
 BM 1460 DATA B002,0,B02A,0,AA02,
 AAAA,A0,0
 LF 1470 DATA B0AA,0,0,B0AA,0,0,B
 0AA,0
 DI 1480 DATA 0,B0AA,0,0,B0AA,0,0
 ,B0AA
 FM 1490 DATA 0,0,B0A2,0,200,A0B0
 ,0,A00
 JC 1500 DATA 2B00,0,2B00,A0B,0,2
 B00,2B0,0B
 BL 1510 DATA 2B00,0,A0,2B00,0,A0
 ,AB02,2B0
 KN 1520 DATA 0,0
 OO 1530 REM L1
 OO 1540 DATA 48,21,0,A,0,0,B022,
 2
 EJ 1550 DATA 0,B0AA,B002,0,2A,2A
 ,0,2B0
 PD 1560 DATA A0,0,AA2A,0,2B0,A0A
 A,0,2A0B
 GC 1570 DATA B0AA,0,A002,B0AA,0,
 AA,B0AA,0
 DC 1580 DATA 20,B0AA,0,0,B0AA,0,
 0,B0AA
 KO 1590 DATA 0,0,B0A2,0,200,B0B2
 ,0,A00
 FA 1600 DATA B002,0,A00,A000,0,A
 00,2B00,0
 AH 1610 DATA 200,2B00,0,200,A0B0
 ,0,A00,0
 LL 1620 DATA 0,0
 BL 1630 REM L2
 PL 1640 DATA 48,21,0,A,B00A,0,0B
 22,2B
 DK 1650 DATA 0,B0AA,A0,0,22A,B0,
 0,A0A
 EB 1660 DATA 0,0,AB2A,0,200,A0AA
 ,0,A00
 NJ 1670 DATA B0AA,0,2B00,B0AA,0,
 A000,B0AA,0
 LL 1680 DATA B002,B0AA,0,A,B0AA,
 0,AB,B0AA
 KA 1690 DATA 0,0,B0A2,0,200,B0B2
 ,0,A00
 BK 1700 DATA B002,0,A00,A000,0,A
 00,2B00,A0
 FL 1710 DATA 2B0,0B,0,A,2B0,0B,2B
 ,A0B,0
 LN 1720 DATA 0,0
 CI 1730 REM L3
 EF 1740 DATA 42,21,B002,2B,0,A0A
 ,A,0
 EO 1750 DATA 222B,B0B2,2B,AAA0,0
 B0B2,2B,2A0,B002
 BB 1760 DATA A0,A2B,2B0,A0,A0A,
 AAB,0,A0B2
 HA 1770 DATA 2B0B,0,A000,A0B0,0,
 A0B0,B0B2,0
 DL 1780 DATA A000,B0,0,A000,A0,
 0,A0B0,A0
 HA 1790 DATA 0,A000,0,0,A000,0,0
 ,A000
 EE 1800 DATA 0,0,A000,0,0,A000,0
 ,0
 PA 1810 DATA A000,0,0,A000,0,0,A
 000,0
 LP 1820 DATA 0,0
 EA 1830 REM R1
 EP 1840 DATA 48,21,0,A,0,20,B022
 ,0
 IC 1850 DATA AB,B0AA,0,B00A,2A,0
 ,AB00,A
 BB 1860 DATA 0,A00,B0AA,0,0,A0AA
 ,0,0

CF 1870 DATA AAAA,0,0,B2AA,A0,0,
 B0AA,B02A
 KE 1880 DATA 0,B0AA,2,0,B0AA,0,0
 ,B0AA
 KE 1890 DATA 0,0,B0A2,0,200,B0B2
 ,0,A00
 MA 1900 DATA B002,0,A00,B002,0,A
 00,B002,0
 JO 1910 DATA A00,A000,0,A000,200
 0,0,A,A000
 LB 1920 DATA 0,0
 FM 1930 REM R2
 CI 1940 DATA 44,21,AB,2B,0,A,BA,
 0
 SA 1950 DATA B202,AA,0,A000,A0,0
 ,2B00,2B
 NI 1960 DATA 0,A0,AA,0,0,2B0,B0AA
 ,0,2B0
 MO 1970 DATA A0AA,0,2B0,2BAA,0,2
 00,AAA,0
 KH 1980 DATA 200,2AA,B0,2B0,AA,A
 B,2B0,AA
 KL 1990 DATA 20,2B0,B0,0,A00,A,0
 ,2B00
 MA 2000 DATA A,0,2B00,A,0,2B00,A
 ,0
 NE 2010 DATA AB02,B002,0,0,B000,
 0,0,B002
 KA 2020 DATA 0,0
 EH 2030 REM R3
 CI 2040 DATA 42,21,0,A00,0,2B0,B
 2B2,0B
 LL 2050 DATA A00,A0B0,A0,2B00,A0
 ,2A,2B0A,B00A
 HC 2060 DATA A0,AAB,0B02,0B,2B0,
 AAAA,0,B002
 JF 2070 DATA A0AA,0,A000,A02A,0,
 2B00,A02A,0
 BB 2080 DATA A00,A02A,0,2B0,A0AA
 ,0,0,A0AA
 CA 2090 DATA 0,0,A000,0,0,A000,0
 ,0
 MA 2100 DATA A000,0,0,A000,0,0,A
 000,0
 NN 2110 DATA 0,A000,0,0,A000,0,0
 ,A000
 KC 2120 DATA 0,0
 HD 2130 REM fig 12
 NF 2140 DATA 32,21,A00,A00,B00,A
 20,A2B,2B0B
 MO 2150 DATA B00,A0B0,B020,B0B2,
 A000,A0,2A00,A0
 ID 2160 DATA 2A00,A0,2A00,AB,2A0
 ,0,AB,2A0B
 FB 2170 DATA 2A00,AB,2A00,AB,2B0
 ,0,2B,A000,A
 FE 2180 DATA B002,B002,B002,B002
 ,B002,B002,B002,B002
 NO 2190 DATA B002,B002,B002,A0B0
 ,0
 IL 2200 REM fig 13
 HD 2210 DATA 32,18,0,2A,0,B02A,0
 ,B02A
 NN 2220 DATA 0,B0AA,0,0,0,A002,0
 B002,A00A
 CB 2230 DATA A002,AA2A,2B00,AAA0
 ,2B00,A00,A0,2B00
 CP 2240 DATA 2A2B,A000,A0B0,A0B0
 ,B2B0,AAA0,B2,AA2A
 AF 2250 DATA A0,A0B0,AAA0,AAA0,A
 A2A,AAA0
 IN 2260 REM block
 PK 2270 DATA 16,8,5050,5050,505,
 505,5050,5050
 BD 2280 DATA 505,505,0
 BB 2290 DATA REM cross
 DO 2300 DATA 16,8,550,1414,505,
 505,5005,5005
 MA 2310 DATA 1414,550,0
 CS 2320 REM ladder
 DH 2330 DATA 16,8,2B0,2B0,2B0,2B
 0,AAA0,2B0
 MM 2340 DATA 2B0,2B0,0
 DF 2350 REM purple head
 UL 2360 DATA 16,8,A002,B00A,B00A

,A002,B2A,AAA0
 JB 2370 DATA AAAA,AAA0,0
 ND 2380 REM white head
 KJ 2390 DATA 16,8,F003,FC0F,FC0F
 ,F003,FC3F,FFFF
 MA 2400 DATA FFFF,FFFF,0
 KX 2410 REM blue head
 ND 2420 DATA 16,8,5401,5405,5405
 ,5401,5415,5555
 DH 2430 DATA 5555,5555,0

Program 4: Amiga Tightrope

Version by Patrick Parrish,
 Programming Supervisor

Please refer to the typing instructions in this article before entering this listing.

```

  GOSUB setup:GOTO 704
  1 PUT (X,Y),w3,PSET:RETURN
  2 PUT (X,Y),w2,PSET:RETURN
  3 PUT (X,Y),w1,PSET:RETURN
  4 PUT (X,Y),11,PSET:RETURN
  5 PUT (X,Y),12,PSET:RETURN
  6 PUT (X,Y),13,PSET:RETURN
  7 PUT (X,Y),14,PSET:RETURN
  8 PUT (X,Y),15,PSET:RETURN
  9 PUT (X,Y),16,PSET:RETURN
  10 PUT (X,Y),w4,PSET:RETURN
  20 JV=0:z$=UCASE$(INKEY$):4
  IF a$=CHR$(47) THEN 4
  JV=1:AV=0:RETURN
  END IF4
  IF a$=CHR$(90) THEN 4
  JV=2:AV=0:RETURN
  END IF4
  21 AV=AV+14
  IF AV=b*4 THEN AV=0:RETURN
  22 GOTO 204
  23 r1=INT(26*RND(1))+14
  X9=INT(X/B):r2=r1+644
  a0=LOCATE 3,X9:PRINT CHR$(r2)+4
  24 a$=UCASE$(INKEY$):a=a+14
  IF a=b THEN 4
  M1=24
  GOSUB 1770:GOTO 304
  END IF4
  25 IF a$="" THEN 244
  26 IF a$=CHR$(r2) THEN 4
  M1=14
  GOSUB 1740:GOTO 304
  END IF4
  27 M1=2:GOSUB 1770+
  30 LOCATE 3,X9:PRINT " "
  RETURN4
  31 T=3*T+INT(TIMER-T2)+4
  T=1000-T3:IF T<0 THEN T=0
  32 RETURN4
  70 CLS:FOR X=0 TO 36 STEP 364
  FOR J=0 TO 24
  PUT (*X+B*J+8,40),s14:NEXT J,X4
  LINE (24,40)-(287,40),34
  75 FOR J=0 TO 38 STEP 384
  I=1 TO 154
  PUT (J*8,I*8+40),s15+
  PUT (J*8+B+(J=38)*16,I*8+40),s16
  4
  NEXT I,J4
  80 FOR r=1 TO 3:FOR G=6-r TO 364
  X=RND(1):ROW=64+8*r:COL=c*8+
  IF X<.3 THEN4
  PUT(COL,ROW),s17:GOTO 1004
  END IF4
  85 IF X>-.3 AND X<.6 THEN4
  PUT(COL,ROW),s18:GOTO 1004
  END IF4
  90 IF X>-.6 AND X<.9 THEN4
  PUT(COL,ROW),s19:GOTO 1004
  END IF4
  95 LOCATE ROW/8,COL/8:PRINT " "
  100 NEXT c,I4
  101 LINE (39,75)-(17,96)+4
  LINE (38,75)-(16,96)+4
  FOR I=96 TO 96+74
  LINE (16,I)-(8*37-1,I):NEXT I4
  
```

```

107 LINE (23,20*8-1)-(36*8,20*8-
1)4
LINE (7,22*8)-(38*8,22*8)4
LINE (23,20*8)-(7,22*8)4
LINE (36*8,20*8-1)-(38*8,22*8)4
108 FOR r=0 TO 14
FOR C=3-r TO 35+r4
PUT (8, (r+20)*8),s154
NEXT C,r4
109 LINE (7,22*8)-(7,24*8)4
LINE (38*8,22*8)-(38*8,24*8)4
LINE (23,22*8)-(23,23*8)4
LINE (36*8,22*8)-(36*8,23*8)4
160 JV=19:PX=7:PX=10:=04
440 T2=TIMER4
500 IF w=2 AND d=8 THEN4
b=1004
END IF4
IF w=2 AND d=9 THEN4
b=654
END IF4
510 P=0:GOSUB 30004
FOR X=288 TO 4 STEP -34
520 C=c+d+1:GOSUB 314
550 LOCATE 1,14
PRINT "SCORE" "TAB(16)" "BONU
S" "4
PRINT TAB(31)"LEVEL"4
600 f=0:IF X<268 AND X>24 THEN G
OSUB 7804
605 IF f=1 THEN 10804
630 P=P+1:IF P=5 THEN P=14
640 ON P GOSUB 1,2,3,24
655 JV=0:a$=UCASE$(INKEY$):IF a$ =
="" THEN GOSUB 15104
IF a$=CHR$(47) THEN JV=1:GOSUB 8
104
660 IF a$=CHR$(90) THEN JV=2:GOS
UB 9504
665 IF f=1 THEN 10804
670 NEXT X:X=X+34
GOSUB 3000:GOSUB 104
710 c=c+1:T=04
720 IF d9 THEN b=b-2:d=d+14
750 IF w2 AND d9 THEN b=b-254
760 IF d9 THEN PX=6:PX=94
770 GOTO 4404
780 r=INT(9*Rnd(1))+14
IF r>7 THEN RETURN4
800 IF r=1 THEN 9504
810 P=4:PUT (X,Y),11,PSET4
820 IF w1 THEN GOSUB 204
IF w=2 THEN GOSUB 234
840 IF M1=1 THEN JV=24
IF M1=2 THEN JV=14
860 IF JV=2 THEN4
P=14
ON P GOSUB ,3,4,5,64
IF P4 THEN RETURN ELSE 8204
END IF4
880 P=P+1:ON P GOSUB ,4,5,64
890 GOSUB 314
910 LOCATE 1,21:PRINT T4
920 IF P3 AND P>PX THEN 8204
930 f=1:RETURN4
950 P=7:PUT (X,Y),r1,PSET4
960 IF w1 THEN GOSUB 204
IF w2 THEN GOSUB 234
980 IF M1=1 THEN JV=14
IF M1=2 THEN JV=24
990 IF JV=1 THEN P=P-14
1010 GOSUB 314
1030 LOCATE 1,21:PRINT T4
1040 IF P<7 THEN P=3:RETURN4
1050 IF JV=1 THEN4
ON P GOSUB , , , ,7,8,94
GOTO 9604
END IF4
1060 P=P+14
ON P GOSUB , , , ,7,8,94
1070 IF P>6 AND P>PZ THEN 9604
1075 f=1:RETURN4
1080 P=104
PUT (X,Y),w4,PSET4

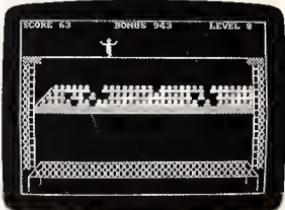
```

'FALLING MAN4
1090 Z=234
FOR Z=22 TO 150 STEP 64
IF Z>22 THEN PUT (X,Z-6),s124
1100 PUT (X,Z),s124
SOUND (Z+15)*2,,084
1110 NEXT Z4
PUT (X,Z),s12,Y=Y+504
1120 FOR Z=150 TO Y STEP -64
IF Z<150 THEN PUT (X,Z-6),s134
1125 PUT (X,Z),s134
SOUND (Z+15)*2,,1:NEXT Z4
PUT (X,Z+6),s134
1130 FOR Z=Y TO 150 STEP 64
IF Z>Y THEN PUT (X,Z-6),s134
1135 PUT (X,Z),s134
SOUND (Z+15)*2,,1:NEXT Z4
PUT (X,Z-6),s13=Y+304
IF Y>150 THEN 11204
1160 PUT (X,Z-6),s13:LOCATE 3,64
PRINT "Press <RETURN> to play ag
ain"4
LOCATE 4,74
PRINT "Press <SPACE BAR> for men
u"4
1170 a\$=INKEY\$4
IF a\$<>" " AND a\$<>CHR\$(13) THEN
11704
1180 c=0:MI=0:AV=04
IF a\$=CHR\$(13) THEN 704
GOSUB again:GOTO 704
1510 T4=INT(TIMER)4
1520 a\$=INKEY\$4
IF a\$<="" THEN 15204
1530 TS=INT(TIMER):T2=T2+TS-T44
RETURN4
1740 SOUND 440,1:RETURN4
1770 SOUND 2300,1:RETURN4
3000 FOR DE=1 TO 400:NEXT:RETURN
4
setup:4
DEFINT L,I,S,W4
SCREEN 1,320,200,2,14
' OPEN WINDOW 3 WITH NO GADGETS
OR4
' title BAR4
WINDOW 1,"",,(0,0)-(311,25),16,14
WINDOW 3,"",,(0,0)-(311,185),16,1
4
4
WINDOW OUTPUT34
PALETTE 0,,0,0,04
PALETTE 1,,5,1,14
PALETTE 2,1,0,04
PALETTE 3,1,1,14
WIDTH 404
CLS4
DIM voice\$(8),w4%(200)4
GET (0,0)-(25,20),w4%4
RESTORE VOICEDATA4
FOR J=0 TO 84
READ voice\$(J)4
NEXT4
' Speech will be synchronous4
VOICEDATA4
DATA 110,0,170,0,22200,64,10,1,0
4
4
talk\$="Welcome to Tightrope"4
LOCATE 12,114
PRINT talk\$4
GOSUB talk4
L= 87 :DIM w1\$(L)4
FOR I=0 TO L:READ a\$:w1\$(I)=VAL(
"&h"+a\$):NEXT4
shapedata4
DATA 18,15,2,30,0,58,0,FB4
DATA 0,4070,800,C030,1800,2078,2
000,1FFF4
DATA 0,FB,0,FB,0,FB,0,D84
DATA 0,D8,0,D8,0,78,0,384
DATA 0,1C,0,18,0,78,0,04
L= 87 :DIM w2\$(L)4
FOR I=0 TO L:READ a\$:w2\$(I)=VAL(
"&h"+a\$):NEXT4
DATA 18,15,2,30,0,58,0,FB4
DATA 0,FB,0,FB,0,FB,0,FB4
DATA 0,198,0,318,0,318,0,18C4
DATA 0,186,0,30C,0,30,0,784
DATA 0,FB,0,4070,800,C030,1800,2
0784
DATA 2000,1FFF,C000,FB,0,FB,0,FB
4
DATA 0,FB,0,FB,0,FB,0,D84
DATA 0,198,0,318,0,318,0,3184
DATA 0,18C,0,186,0,30C,0,04
L= 87 :DIM w3\$(L)4
FOR I=0 TO L:READ a\$:w3\$(I)=VAL(
"&h"+a\$):NEXT4
DATA 18,15,2,30,0,58,0,FB4
DATA 0,4070,800,C030,1800,2078,2
000,1FFF4
DATA C000,FB,0,FB,0,FB,0,FB4
DATA 0,FB,0,FB,0,D8,0,18C4
DATA 0,306,0,603,0,601,8000,6004
DATA C000,600,C000,1E01,8000,30,
0,784
DATA 0,FB,0,4070,800,C030,1800,2
0784
DATA 2000,1FFF,C000,FB,0,FB,0,FB
4
DATA 0,FB,0,FB,0,FB,0,D84
DATA 0,18C,0,306,0,603,0,6014
DATA 8000,600,C000,600,C000,1E01
,8000,04
L= 87 :DIM r1\$(L)4
FOR I=0 TO L:READ a\$:r1\$(I)=VAL(
"&h"+a\$):NEXT4
DATA 18,15,2,30,0,58,0,FB4
DATA 1800,70,7000,31,C000,7F,0,1
FC4
DATA 0,7FB,0,1FC8,0,F0FB8,0,40FB4
DATA 0,FB,0,FB,0,D8,0,1984
DATA 0,318,0,30C,0,306,0,1864
DATA 0,18C,0,300,0,30,0,784
DATA 1000,FB,1800,70,7000,31,C00
0,0,7F4
DATA 0,1FC,0,7FB,0,1CF8,0,F0FB4
DATA 0,40FB,0,FB,0,FB,0,D84
DATA 0,198,0,318,0,30C,0,3064
DATA 0,186,0,18C,0,300,0,04
L= 87 :DIM r2\$(L)4
FOR I=0 TO L:READ a\$:r2\$(I)=VAL(
"&h"+a\$):NEXT4
DATA 18,15,2,30,3800,58,6000,FB4
DATA C000,71,8000,33,0,7E,0,1FC4
DATA 0,3FB,0,6FB,0,CFB8,0,1FB84
DATA 0,30FB,0,E0FB,0,D8,0,1984
DATA 0,318,0,30C,0,307,C000,1804
DATA C000,1800,4000,300,0,30,3800
,784
DATA 6000,FB,C000,71,8000,33,0,7
E4
DATA 0,1FC,0,3FB,0,6FB,0,CFB4
DATA 0,18FB,0,30FB,0,E0FB,0,D84
DATA 0,198,0,318,0,30C,0,3074
DATA C000,180,C000,180,4000,300,
0,04
L= 87 :DIM r3\$(L)4
FOR I=0 TO L:READ a\$:r3\$(I)=VAL(
"&h"+a\$):NEXT4
DATA 15,15,2,1860,798,3330,330,
5984
DATA 47C2,CF98,478C,C718,C7B0,63
,31,C7C0,3FE4
DATA 400,1FC6,400,F8C,400,F98,79
,8,FB4
DATA 330,FE0,7C2,FC0,78C,C00,7B0
,C004

```

DATA 7C0, C00, 400, C00, 400, C00, 400
,C004
DATA 400, C00, 400, 3C00, 0, 1860, 0, 3
3304
DATA 0, 6798, 4000, CF98, 4000, C718,
C000, 63314
DATA C000, 3FE3, 0, 1FC6, 0, F8C, 0, F9
84
DATA 0, F8B, 0, F8B, 0, F8B, 0, C004
DATA 0, C00, 0, C00, 0, C00, 0, C004
DATA 0, C00, 0, C00, 0, C00, 0, 0, 04
L= 87 :DIM 11%(L)*
FOR I=0 TO L:READ a$:s11%(I)=VAL(
"sh"+a$):NEXT*
DATA 18, 2, 0, 98, 30, 30, 40584
DATA C2, E0F8, 8C, 3870, B0, E30, C0, 3
F84
DATA 0, FC, 0, FF, 0, F9, C098, F84
DATA 7830, F8, 10C2, F8, 8C, D8, 80, 19
84
DATA C0, 318, 0, 318, 0, 318, 0, 30C4
DATA 0, F44, 0, C, 0, 0, 0, 304
DATA 0, 4878, 0, E0F8, 0, 3870, 0, E304
DATA 0, 3F8, 0, FC, 0, FF, 0, F94
DATA C000, F8, 7800, F8, 1000, F8, 0, D
84
DATA 0, 198, 0, 318, 0, 318, 0, 3184
DATA 0, 30C, 0, F44, 0, C, 0, 04
L= 87 :DIM 12%(L)*
FOR I=0 TO L:READ a$:s12%(I)=VAL(
"sh"+a$):NEXT*
DATA 16, 15, 2, 0, 98, E060, 30, 30B04
DATA C2, 19F0, 8C, C00, B0, 660, C0, 3F
04
DATA 0, 1F8, 0, 1FC, 0, 1F6, 98, 1F34
DATA 30, 1F1, 80C2, 1F0, E08C, 1B0, 40
B0, 3304
DATA C0, 630, 0, 630, 0, 630, 0, 6184
DATA 0, 1E08, 0, 18, 0, 0, B2684
DATA 0, 3F0, 0, 19F0, 0, C0E, 0, 6604
DATA 0, 3F0, 0, 1F8, 0, 1FC, 0, 1F64
DATA 0, 1F3, 0, 1F1, 8000, 1F0, E000, 1
B04
DATA 4000, 330, 0, 630, 0, 630, 0, 6304
DATA 0, 618, 0, 1E08, 0, 18, 0, 04
L= 87 :DIM 13%(L)*
FOR I=0 TO L:READ a$:s13%(I)=VAL(
"sh"+a$):NEXT*
DATA 14, 15, 2, C3, 98, 199, 8030, 832C
4
DATA C0C2, 867C, C08C, C638, C0B0, E3
19, 80C0, 31FF4
DATA 0, 18FE, 0, C7C, 0, 67C, 98, 37C4
DATA 30, 1FC, C2, FC, 8C, C, B0, C4
DATA C0, C, C, C, C, C, C, C4
DATA 0, C, 0, F, 0, C3, 0, 1994
DATA 8000, 833C, C000, 867C, C000, C6
38, C000, E3194
DATA 8000, 31FF, 0, 18FE, 0, C7C, 0, 67
C4
DATA 0, 37C, 0, 1FC, 0, FC, 0, C4
DATA 0, C, 0, C, 0, C, 0, C4
DATA 0, C, 0, C, 0, F, 0, 04
L= 87 :DIM s128(L)*
FOR I=0 TO L:READ a$:s128%(I)=VAL(
"sh"+a$):NEXT*
DATA 13, 15, 2, C3C3, 98, C243, 30, 63C
64
DATA C2, 324C, 8C, 1998, B0, FF0, C0, 7
E04
DATA 0, 7E0, 0, 7E0, 0, 7E0, 0, 7E04
DATA 30, 7E0, C2, 7E0, 8C, 660, B0, C30
4
DATA C0, 1818, 0, 1818, 0, 1818, 0, 181
84
DATA 0, 1818, 0, 781E, 0, C3C3, 0, C3C3
4
DATA 0, 63C6, 0, 324C, 0, 1998, 0, FF04
DATA 0, 7E0, 0, 7E0, 0, 7E0, 0, 7E04
DATA 0, 7E0, 0, 7E0, 0, 7E0, 0, 6604
DATA 0, C30, 0, 1818, 0, 1818, 0, 18184
DATA 0, 1818, 0, 1818, 0, 781E, 0, 04
L= 39 :DIM s138(L)*
FOR I=0 TO L:READ a$:s138%(I)=VAL(
"sh"+a$):NEXT*
DATA 10, 12, 2, 70, 78, 78, 38, 04
DATA 1C, 183E, 1C7F, 6CF, 18F, 400F, 6
70F, 2FBF4
DATA B9FF, 907F, C00F, FFFF, 7FFE, 70
78, 784
DATA 38, 0, 1C, 183E, 1C7F, 6CF, 18F, 4
00F4
DATA 670F, 2FBF, B9FF, 907F, C00F, FF
FF, 7FFE, 18184
L= 19 :DIM s18%(L)*
FOR I=0 TO L:READ a$:s18%(I)=VAL(
"sh"+a$):NEXT*
DATA 8, 8, 2, 1C00, 3E00, 3E00, 1C00, 7
E004
DATA FF00, FF00, FF00, 0, 0, 0, 0, 0, 04
DATA 88, 80, 80, 04
L= 19 :DIM s17%(L)*
FOR I=0 TO L:READ a$:s17%(I)=VAL(
"sh"+a$):NEXT*
DATA 8, 8, 2, 0, 0, 0, 0, 0, 04
DATA 0, 0, 0, 1C00, 3E00, 3E00, 1C00, 7
E004
DATA FF80, FF00, FF80, 04
L= 19 :DIM s19%(L)*
FOR I=0 TO L:READ a$:s19%(I)=VAL(
"sh"+a$):NEXT*
DATA 8, 8, 2, 1C00, 3E00, 3E00, 1C00, 7
E004
DATA FF00, FF00, FF00, 1C00, 3E00, 3E
00, 1C00, 7E004
DATA FF80, FF80, FF80, 04
L= 19 :DIM s15%(L)*
FOR I=0 TO L:READ a$:s15%(I)=VAL(
"sh"+a$):NEXT*
DATA 8, 8, 2, C300, 6600, C300, 0, 0, 0, 04
DATA 0, 0, 0, 04
L= 19 :DIM s16%(L)*
FOR I=0 TO L:READ a$:s16%(I)=VAL(
"sh"+a$):NEXT*
DATA 8, 8, 2, 8100, 8100, 8100, 8100, F
004
DATA 8100, 8100, 8100, 8100, 8100, 81
00, 8100, FF004
DATA 8100, 8100, 8100, 04
L= 19 :DIM s14%(L)*
FOR I=0 TO L:READ a$:s14%(I)=VAL(
"sh"+a$):NEXT*
DATA 8, 8, 2, 70, 78, 78, 38, 04
DATA 1C, 3E, 7F, CCCC, CCBF, 330F, 330
F, CCBF4
DATA CCF, 337F, 330F, FFFF4
again:4
RANDOMIZE TIMER4
4
CLS4
GOSUB title4
RETURN4
4
announce:4
talk$=CS4
4
talk:4
IF talkflag=0 THEN SAY TRANSLATE
$ (talk$), voice4
RETURN4
4
title:4
talk$="press 1 for game, 2 for t
yping4
GOSUB talk4
WINDOW 4, " Press 1 or 2", (6
5, 70)-(250, 110), 16, 1
PRINT:PRINT " 1- Game"4
PRINT:PRINT " 2- Typing"4
4
grabkey:4
a$=INKEY$:IF a$="" THEN grabkey4
w=VAL(a$)4
IF w<1 OR w>2 THEN grabkey4
talk$="press 0 through 9 to choo
se difficulty level."4
GOSUB talk4
WINDOW 4, "Press 0-9 for difficul
ty", (65, 70)-(255, 110), 16, 1
PRINT:PRINT:PRINT " Enter lev
el (0-9)"4
4
grabkey1:4
a$=INKEY$:IF a$="" OR (a$<"0" OR
a$>"9") THEN grabkey14
b=VAL(a$)4
d=b:b=10-b:IF w=1 THEN b=b*24
IF w=2 THEN b=b*404
WINDOW CLOSE 44
temp$="typing"4
IF w=1 THEN temp$="game"4
talk$=temp$+" "+level"+STR
$ (d)4
GOSUB talk4
RETURN4
4
getout:4
WINDOW CLOSE 34
SCREEN CLOSE 14
WINDOW 1, "Tightrope", , 31, -14
WINDOW OUTPUT 14
END4

```



Amiga "Tightrope" requires 512K of memory and uses keyboard controls.



This version of "Tightrope" runs on all Apple II computers using either a joystick or game paddles.

Program 5: Apple Tightrope

Version by Tim Victor, Editorial Programmer

```

25 10 HOME : VTAB 6: HTAB B: PRI
NT "READING DATA, PLEASE W
AIT": GOSUB 770
E4 20 TEXT : HOME : VTAB 12: HTA
B 15: PRINT "(1) GAME": HT
AB 15: PRINT "(2) TYPING":
GET A$:GN = VAL (A$): IF
GM < 1 OR GM > 2 THEN 20
97 30 HOME : VTAB 12: HTAB 10: P
RINT "DIFFICULTY(0-9) ":";
GET L$: IF L$ < "0" OR L$ >
"9" THEN 30
S2 40 GDSUB 590
CE 50 CALL 32771
S8 60 LV = VAL (L$):SC = 0
C5 70 BO = 1000: GOSUB 520: I = 2
SB 55

```

```

CB 80 FOR S = 1 TO 3: CALL 3276B
  ,S,I - S * 2,32: FOR J = 1
  TO 200: NEXT : NEXT
7C 90 I = I - 6: IF I > 228 THEN
  80
EE 100 OF = 225 / (LV + 1.5):C =
  0
2E 110 FOR J = 1 TO 1000: NEXT
E2 120 IF RND (1) > .0B * (10 -
  LV) THEN GOSUB 320
B9 130 IF C = 1 THEN 280
FA 140 IF GM = 2 THEN 170
A6 150 IF POL (0) < 90 THEN A =
  4: GOSUB 330: GOTO 130
19 160 IF POL (0) > 90 THEN A =
  B: GOSUB 330: GOTO 130
18 170 FOR S = 1 TO 3: CALL 3276
  B,S,I - S * 2,32
23 180 BO = BO - 3: IF BO < 0 TH
  EN BO = 0
15 190 SC = SC + LV + 1: GOSUB 5
  20
78 200 FOR J = 1 TO 150: NEXT
BB 210 NEXT : I = I - 6: IF I > 1
  B THEN 120
F1 220 LV = LV + 1: IF LV > 9 TH
  EN LV = 9
92 230 SC = SC + BO: GOSUB 520:
  FOR J = 1 TO 400: NEXT
16 240 FOR S = 1 TO 3: CALL 3276
  B,S,I - S * 2,32
36 250 FOR J = 1 TO 300: NEXT :
  NEXT
3F 260 I = I - 6: IF I > 0 THEN
  240
3B 270 GOTO 70
CD 280 VTAB 2: HTAB 7: PRINT "PR
  ESS RETURN TO PLAY AGAIN"
  : HTAB 8: PRINT "PRESS SP
  ACE BAR FOR MENU"
EC 290 POKE 49168,0: GET A*: IF
  A* = CHR# (32) THEN 20
BD 300 IF A* = CHR# (13) THEN VT
  AB 2: PRINT SPC (80): GOT
  O 60
BA 310 HOME : TEXT : END
BD 320 A = (RND (1) > .5) * 4 +
  4
73 330 CALL 3276B,A,1,32
9A 340 IF GM = 1 THEN 400
74 350 C$ = CHR# (65 + 26 * RND
  (1)): VTAB 3: HTAB INT (I
  / 7) + 1: PRINT C$
75 360 POKE 49168,0: CT = OF
95 370 K = PEEK (49152): IF K <
  128 THEN CT = CT - 1: IF
  CT > 0 THEN 370
77 380 IF K > 127 AND K - 128 =
  ASC (C$) THEN 500
A8 390 PRINT CHR# (<7): GOTO 440
A0 400 CT = OF / 6
B8 410 IF POL (0) > 89 AND POL (
  0) < 157 THEN CT = CT - 1
  : IF CT > 0 THEN 410
39 420 IF POL (0) < 90 AND A > 7
  OR POL (0) > 156 AND A <
  8 THEN 500
74 430 FOR J = 1 TO CT: NEXT
60 440 A = A + 1: BO = BO - 3: IF
  A = 8 THEN A = 12
34 450 IF A < 12 THEN 330
7E 460 FOR T = 0 TO 40: Y = 142 -
  110 * EXP (- T / 10) *
  ABS (COS (T / 2))
19 470 CALL 3276B,12,I,Y
33 480 FOR CT = 1 TO 12: NEXT :
  NEXT
M 490 C = 1: VTAB 3: HTAB INT (
  I / 7) + 1: PRINT " "; RE
  TURN
C3 500 A = A - 1: IF A < 3 AND
  A < 7 THEN 330
7B 510 VTAB 3: HTAB INT (I / 7)
  + 1: PRINT "C = 0: RET
  URN
  M 520 A = FRE (0): VTAB 1: HTAB
  3: PRINT "SCORE: "; HTAB
  16: PRINT "BONUS: "; HTAB
  B 29: PRINT "LEVEL: "
AF 530 HTAB 9:NL = 5:NN = SC: GO
  SUB 560
73 540 HTAB 22:NL = 5:NN = BO: G
  OSUB 560
63 550 HTAB 35:NL = 1:NN = LV
F2 560 NSS = RIGHT$ (STR$ (NN),
  NL)
11 570 IF LEN (NSS) < NL THEN NS
  $ = "0" + NSS: GOTO 570
14 580 PRINT NSS: RETURN
A8 590 HCOLOR = 7: HCOLOR = 7
4F 600 HCOLOR = 6: FOR X = 1 TO 1
  2: HPLOT 62,126 + X TO 19
  B,126 + X TO 240,76 + X:
  NEXT
26 610 VTAB 10: FOR V = 1 TO 7:
  HTAB 17 - V: IFH FOR H = 1 TO
  19: PRINT CHR$ (60 + INT
  (4 * RND (1))): NEXT :
  PRINT : NEXT
34 620 HCOLOR = 7: FOR X = 160 TO
  60 STEP - 6: HPLOT 10,X
  TO 17,X: HPLOT 250,X TO 2
  57,X: NEXT
3E 630 FOR X = 0 TO 240 STEP 240
  : FOR Y = 0 TO 7 STEP 7:
  HPLOT 10 + X + Y,164 TO 1
  0 + X + Y,56: NEXT : NEXT
B1 640 HPLOT 4,56 TO 263,56
B5 650 HCOLOR = 5: HPLOT 40,148 T
  O 245,148 TO 225,173 TO 2
  0,173 TO 40,148
E7 660 FOR X = - 12 TO 223 STEP
  12: SX = X:SY = 173:EX = X
  + 50: EY = 148
94 670 IF SX < 20 THEN SX = 30 -
  2 * / 3: SY = 173 - SX
  / 2 + X / 2
J7 680 IF EX > 245 THEN EX = 376
  - 2 * X / 3: EY = 173 - E
  X / 2 + X / 2
6E 690 HPLOT SX,SY TO EX,EY: NEX
  T
D5 700 FOR X = 20 TO 295 STEP 14
  : SX = X:SY = 173:EX = X -
  50: EY = 148
34 710 IF EX < 40 THEN EX = 15 +
  2 * X / 7: EY = 173 + EX
  / 2 - X / 2
M 720 IF SX > 225 THEN SX = 161
  + 2 * X / 7: SY = 173 + S
  X / 2 - X / 2
63 730 HPLOT SX,SY TO EX,EY: NEX
  T
9C 740 HPLOT 19,173 TO 19,180: H
  PLOT 225,173 TO 225,180:
  HPLOT 245,148 TO 245,155
21 750 RETURN
FD 760 PRINT "DATA ERROR": END
4E 770 FOR A = 760 TO A + 87: RE
  AO 0: POKE A,0: NEXT
94 780 READ O: IF O < > - 1 THEN
  760
B8 790 FOR A = 32768 TO A + 502:
  READ O: POKE A,0: NEXT
B5 800 READ O: IF O < > - 1 THEN
  760
7C 810 FOR A = 33620 TO A + 863:
  READ O: POKE A,0: NEXT
B9 820 READ O: IF O < > - 1 THEN
  760
7A 830 FOR A = 36067 TO A + 7: P
  OKE A,128: NEXT
7E 840 FOR A = 36200 TO A + 367:
  READ O: POKE A,0: NEXT
BF 850 READ O: IF O < > - 1 THEN
  760
63 860 IF PEEK (190 + 256) = 76
  THEN 870 PRINT CHR$ (4): "PRMA
  768": GOTO 880
C7 870 POKE 54,0: POKE 55,3: CAL
  L 1002
58 880 POKE 6,0: POKE 7,141: POK
  E 230,64
2A 890 RETURN
79 900 DATA 216,120,133,69,134,7
  0,132,71,166,7,10
90 910 DATA 10,176,4,16,62,4B,4,
  16,1,232,232
4E 920 DATA 10,134,27,24,181,6,1
  33,26,144,2,230
F0 930 DATA 27,165,40,133,8,165,
  41,41,3,5,230
99 940 DATA 133,9,162,B,160,0,17
  7,26,36,50,48
D8 950 DATA 2,73,127,164,36,145,
  8,230,26,208,2
34 960 DATA 230,27,165,9,24,105,
  4,133,9,202,208
E7 970 DATA 226,165,69,166,70,16
  4,71,88,76,240,253
C3 980 DATA -1
D6 990 DATA 76,6,128,76,71,12B,1
  73,9,130,240,3
B7 1000 DATA 32,77,12B,32,141,12
  B,176,57,32,140,129
IF 1010 DATA 176,52,32,227,129,1
  76,47,173,249,129,133
J3 1020 DATA 252,141,7,130,173,2
  50,129,133,233,141,B
M9 1030 DATA 130,173,255,129,141
  ,4,130,173,2,130,141
IC 1040 DATA 5,130,173,3,130,141
  ,6,130,169,255,141
M5 1050 DATA 9,130,76,182,128,16
  9,0,141,9,130,96
CE 1060 DATA 173,7,130,133,252,1
  73,8,136,133,253,173
B3 1070 DATA 4,130,141,255,129,1
  73,5,130,141,2,130
S1 1080 DATA 173,6,130,169,2,141
  ,251,129,169,24,141
E6 1090 DATA 252,129,32,36,129,3
  2,205,128,32,22,129
B8 1100 DATA 238,255,129,165,252
  ,24,105,3,133,252,144
E8 1110 DATA 2,230,253,206,252,1
  29,208,228,96,169,12
B8 1120 DATA 141,249,129,169,131
  ,141,250,129,32,236,129
#7 1130 DATA 201,21,144,1,96,141
  ,247,129,169,0,141
FE 1140 DATA 248,129,160,3,32,17
  4,129,160,3,173,247
B1 1150 DATA 129,10,46,248,129,1
  36,208,249,141,247,129
A7 1160 DATA 24,109,249,129,141,
  249,129,173,250,129,109
B2 1170 DATA 248,129,141,250,129
  ,24,96,172,251,129,200
F1 1180 DATA 140,253,129,169,0,1
  53,12,130,136,177,252
B4 1190 DATA 153,12,130,136,16,2
  48,173,12,130,9,127
J3 1200 DATA 141,254,129,172,3,1
  30,240,21,162,0,14
B2 1210 DATA 12,130,189,12,130,1
  6,62,13,130,232,236
F8 1220 DATA 253,127,268,243,136
  ,208,235,172,253,129,185
J7 1230 DATA 12,130,9,128,45,254
  ,129,153,12,130,136
B6 1240 DATA 16,242,96,172,253,1
  29,185,12,130,81,254
D4 1250 DATA 145,254,136,16,246,
  96,173,255,129,41,63
E8 1260 DATA 168,185,76,129,5,23
  0,133,255,173,255,129
A8 1270 DATA 41,8,240,2,169,128,
  24,44,255,129,112
B8 1280 DATA 4,16,4,105,40,105,4
  0,107,2,130,133
71 1290 DATA 254,96,0,4,8,12,16,
  20,24,28,0
B9 1300 DATA 4,8,12,16,20,24,28,
  1,5,9,13

```

EA 1310 DATA 17, 21, 25, 29, 1, 5, 9, 1
 3, 17, 21, 25
 35 1320 DATA 29, 2, 6, 10, 14, 18, 22,
 26, 30, 2, 6
 81 1330 DATA 18, 14, 18, 22, 26, 30, 3
 7, 11, 15, 19
 64 1340 DATA 23, 27, 31, 3, 7, 11, 15,
 19, 23, 27, 31
 5F 1350 DATA 32, 23, 6, 129, 140, 0, 13
 0, 141, 158, 129, 169, 0
 1F 1360 DATA 141, 1, 130, 24, 160, 4,
 185, 216, 152, 3, 106
 6A 1370 DATA 110, 1, 130, 24, 202, 20
 8, 248, 136, 208, 241, 141
 48 1380 DATA 2, 130, 173, 1, 130, 42,
 42, 42, 42, 41, 7
 27 1390 DATA 201, 7, 208, 5, 238, 2, 1
 38, 169, 0, 141, 3
 5F 1400 DATA 130, 173, 1, 130, 240, 2
 3, 24, 173, 3, 130, 185
 EE 1410 DATA 4, 281, 7, 144, 2, 169, 0
 141, 3, 130, 173
 54 1420 DATA 2, 130, 185, 36, 141, 2,
 130, 201, 40, 96, 32
 89 1430 DATA 236, 129, 141, 255, 129
 , 201, 192, 96, 32, 177, 0
 E2 1440 DATA 32, 5, 225, 165, 161, 16
 4, 168, 96
 23 1450 DATA -1
 58 1460 DATA 0, 0, 0, 0, 0, 0, 0, 28, 0,
 0, 60
 59 1470 DATA 0, 0, 62, 0, 0, 28, 0, 0, 1
 2, 0, 6
 43 1480 DATA 0, 48, 84, 42, 21, 0, 42,
 0, 0, 42, 0
 C0 1490 DATA 0, 42, 0, 0, 42, 0, 0, 42,
 0, 0, 42
 88 1500 DATA 0, 62, 0, 0, 62, 0, 0, 5
 1, 0, 64
 FA 1510 DATA 97, 0, 64, 97, 0, 64, 65,
 1, 64, 65, 1
 71 1520 DATA 64, 1, 3, 96, 64, 1, 0, 0,
 0, 0, 0
 7C 1530 DATA 0, 0, 28, 0, 0, 60, 0, 0, 6
 2, 0, 0
 E7 1540 DATA 28, 0, 0, 12, 0, 0, 0, 48,
 64, 42, 21
 8F 1550 DATA 0, 42, 0, 0, 42, 0, 0, 42,
 0, 0, 42
 F7 1560 DATA 0, 0, 42, 0, 0, 42, 0, 0, 6
 2, 0, 0
 83 1570 DATA 62, 0, 0, 54, 0, 0, 54, 0,
 0, 99, 0
 5D 1580 DATA 0, 67, 1, 0, 6, 3, 0, 70, 1
 0, 3
 5C 1590 DATA 0, 0, 0, 0, 0, 0, 0, 0, 28,
 0, 0
 92 1600 DATA 60, 0, 0, 62, 0, 0, 28, 0,
 0, 12, 0
 3A 1610 DATA 6, 0, 48, 84, 42, 21, 0, 4
 2, 0, 0, 42
 E1 1620 DATA 0, 0, 42, 0, 0, 42, 0, 0, 4
 2, 0, 0
 9F 1630 DATA 42, 0, 0, 62, 0, 0, 62, 0,
 0, 54, 0
 88 1640 DATA 0, 38, 0, 0, 30, 0, 0, 60,
 0, 0, 108
 8E 1650 DATA 0, 0, 56, 0, 0, 12, 0, 0, 0
 , 0, 0
 87 1660 DATA 0, 0, 0, 28, 0, 0, 60, 0, 0
 , 62, 0
 88 1670 DATA 0, 28, 0, 0, 12, 48, 0, 0,
 21, 6, 42
 CA 1680 DATA 0, 84, 42, 0, 0, 42, 0, 0,
 42, 0, 0
 85 1690 DATA 42, 0, 0, 42, 0, 0, 42, 0,
 0, 62, 0
 58 1700 DATA 0, 62, 0, 0, 54, 0, 0, 54,
 0, 0, 99
 FC 1710 DATA 0, 0, 67, 1, 0, 6, 3, 0, 70
 1, 0
 33 1720 DATA 3, 0, 0, 0, 0, 0, 0, 0, 2
 0, 0
 B3 1730 DATA 0, 60, 0, 0, 62, 24, 0, 28
 , 0, 0, 12

99 1740 DATA 4, 0, 0, 1, 0, 42, 0, 64, 4
 2, 0, 16
 66 1750 DATA 42, 0, 8, 42, 0, 12, 42, 0
 , 0, 42, 0
 59 1760 DATA 0, 42, 0, 0, 62, 0, 0, 62,
 0, 0, 54
 A2 1770 DATA 0, 0, 102, 0, 0, 67, 1, 0,
 3, 0, 0
 CF 1780 DATA 6, 3, 0, 6, 0, 0, 3, 0, 0, 0
 , 0, 0
 FD 1790 DATA 0, 0, 0, 0, 28, 0, 0, 60, 4
 0, 0, 62
 F8 1800 DATA 16, 0, 28, 4, 0, 12, 4, 0,
 0, 1, 2
 64 1810 DATA 42, 0, 86, 42, 0, 0, 42, 0
 , 0, 42, 0
 8A 1820 DATA 0, 42, 0, 0, 42, 0, 0, 42,
 0, 0, 62
 4F 1830 DATA 0, 0, 62, 0, 0, 102, 0, 0,
 70, 1, 0
 H 1840 DATA 3, 3, 0, 3, 6, 0, 6, 3, 0, 6
 , 0
 #E 1850 DATA 0, 3, 0, 0, 0, 0, 0, 0, 0, 0
 , 0
 DC 1860 DATA 0, 0, 0, 0, 0, 0, 28, 0, 0, 60
 , 12, 12
 H 1870 DATA 62, 4, 0, 28, 4, 16, 12, 1
 , 64, 0, 1
 D1 1880 DATA 0, 42, 0, 0, 42, 0, 0, 42,
 0, 0, 42
 #2 1890 DATA 0, 0, 42, 0, 0, 42, 0, 0, 4
 2, 0, 0
 D6 1900 DATA 62, 0, 0, 126, 0, 0, 102,
 1, 0, 3, 7
 D6 1910 DATA 0, 3, 12, 0, 6, 7, 0, 3, 0,
 0, 0
 73 1920 DATA 0, 0, 0, 0, 0, 0, 28, 0, 0, 60
 , 0, 0
 CF 1930 DATA 62, 0, 6, 28, 0, 4, 12, 0,
 0, 0, 0
 D8 1940 DATA 0, 42, 0, 0, 42, 5, 0, 42,
 48, 0, 42
 F3 1950 DATA 0, 0, 42, 0, 0, 42, 0, 0, 4
 2, 0, 0
 D4 1960 DATA 62, 0, 0, 62, 0, 0, 54, 0,
 0, 124, 0
 H 1970 DATA 0, 124, 1, 0, 12, 3, 0, 10
 8, 1, 0, 16
 21 1980 DATA 0, 0, 12, 0, 0, 0, 0, 0, 0,
 0, 0
 H 1990 DATA 28, 0, 0, 60, 0, 12, 62, 0
 , 8, 28, 0
 D9 2000 DATA 16, 12, 0, 64, 0, 0, 0, 42
 , 0, 0, 42
 H 2010 DATA 1, 0, 42, 4, 0, 42, 48, 0,
 42, 0, 0
 F2 2020 DATA 42, 0, 0, 42, 0, 0, 62, 0,
 0, 62, 0
 H 2030 DATA 0, 60, 0, 0, 124, 0, 0, 76
 , 7, 0, 12
 S2 2040 DATA 6, 0, 12, 3, 0, 16, 0, 0, 1
 2, 0, 0
 H 2050 DATA 0, 0, 0, 0, 0, 0, 28, 0, 6,
 60, 0
 H 2060 DATA 4, 62, 0, 16, 28, 0, 16, 1
 2, 0, 64, 0
 H 2070 DATA 0, 0, 42, 32, 0, 42, 53, 0
 , 42, 0, 0
 H 2080 DATA 42, 0, 0, 42, 0, 0, 42, 0
 , 0, 42, 0
 H 2090 DATA 0, 62, 0, 0, 60, 0, 0, 120
 , 0, 0, 24
 D5 2100 DATA 7, 0, 24, 12, 0, 24, 6, 0,
 24, 0, 0
 H 2110 DATA 24, 0, 0, 12, 0, 0, 0, 0, 0
 , 0, 0
 H 2120 DATA 0, 0, 0, 0, 0, 0, 0, 28, 0,
 24, 60
 H 2130 DATA 0, 16, 62, 24, 16, 28, 0,
 64, 12, 4, 64
 H 2140 DATA 0, 1, 0, 42, 0, 0, 42, 0, 0
 , 42, 0
 H 2150 DATA 0, 42, 0, 0, 42, 0, 0, 42,
 0, 0, 42
 H 2160 DATA 0, 0, 62, 0, 0, 60, 0, 0, 1

20, 1, 0
 #8 2170 DATA 24, 0, 0, 24, 3, 0, 48, 0,
 0, 28, 0
 H 2180 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 , 0
 H 2190 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 28,
 0, 24
 H 2200 DATA 60, 12, 16, 62, 4, 16, 28
 , 4, 64, 12, 1
 32 2210 DATA 64, 0, 1, 0, 42, 0, 0, 42,
 0, 4, 46
 H 2220 DATA 0, 4, 46, 0, 12, 46, 0, 24
 , 46, 0, 48
 H 2230 DATA 58, 0, 96, 63, 0, 64, 127
 , 0, 0, 119, 0
 H 2240 DATA 0, 0, 0, 0, 0, 0, 0
 2250 DATA -1
 A2 2260 DATA 128, 128, 128, 128, 198
 , 128, 128, 128, 128, 128, 128
 H 2270 DATA 190, 128, 198, 128, 128
 , 128, 188, 230, 176, 152, 128
 H 2280 DATA 152, 128, 128, 188, 230
 , 246, 238, 230, 188, 128, 128
 H 2290 DATA 152, 154, 152, 152, 152
 , 188, 128, 128, 188, 230, 176
 H 2300 DATA 140, 238, 254, 128, 128
 , 188, 230, 176, 224, 230, 188
 H 2310 DATA 128, 128, 176, 184, 198
 , 254, 176, 176, 128, 128, 254
 H 2320 DATA 134, 198, 224, 230, 188
 , 128, 128, 188, 134, 198, 230
 H 2330 DATA 230, 188, 128, 128, 254
 , 224, 176, 152, 146, 146, 128
 H 2340 DATA 128, 188, 230, 188, 230
 , 238, 188, 128, 128, 188, 230
 H 2350 DATA 230, 252, 176, 152, 128
 , 128, 128, 152, 152, 128, 152
 H 2360 DATA 152, 128, 128, 198, 198
 , 198, 198, 198, 198, 198, 128, 128
 H 2370 DATA 148, 148, 148, 128, 148
 , 213, 213, 0, 28, 20, 28
 H 2380 DATA 0, 26, 85, 85, 128, 136, 136,
 176, 136, 128, 136, 176
 H 2390 DATA 170, 0, 0, 42, 0, 0, 0, 42
 , 42, 12, 28, 128
 H 2400 DATA 152, 188, 168, 152, 128
 , 128, 128, 252, 238, 254
 H 2410 DATA 230, 230, 128, 128, 198
 , 238, 230, 198, 238, 254, 128
 H 2420 DATA 128, 188, 230, 134, 134
 , 238, 198, 128, 128, 198, 230
 H 2430 DATA 230, 230, 230, 196, 128
 , 128, 254, 134, 134, 198, 134
 H 2440 DATA 152, 128, 128, 254, 134
 , 134, 198, 134, 134, 134, 128
 H 2450 DATA 188, 230, 134, 246, 238
 , 198, 128, 128, 238, 238, 230
 H 2460 DATA 254, 238, 238, 128, 128
 , 152, 152, 152, 152, 152, 152
 H 2470 DATA 128, 128, 224, 224, 224
 , 224, 238, 188, 128, 128, 230
 H 2480 DATA 230, 182, 158, 230, 230
 , 128, 128, 134, 134, 134, 134
 H 2490 DATA 134, 254, 128, 128, 194
 , 238, 254, 238, 238, 238, 128
 H 2500 DATA 128, 198, 230, 230, 230
 , 238, 230, 128, 128, 198, 230
 H 2510 DATA 230, 230, 230, 188, 128
 , 128, 198, 230, 230, 198, 134
 H 2520 DATA 134, 128, 128, 188, 230
 , 238, 230, 182, 236, 128, 128
 H 2530 DATA 190, 230, 230, 190, 230
 , 236, 128, 128, 188, 230, 146
 H 2540 DATA 176, 230, 190, 128, 128
 , 254, 152, 152, 152, 152, 152
 H 2550 DATA 128, 128, 230, 230, 230
 , 238, 230, 198, 128, 128, 230
 H 2560 DATA 230, 230, 230, 230, 152
 , 128, 128, 230, 230, 230, 254
 H 2570 DATA 130, 194, 128, 128, 230
 , 238, 146, 152, 152, 154, 128
 H 2580 DATA 128, 238, 238, 238, 198
 , 152, 152, 128, 128, 254, 176
 H 2590 DATA 152, 146, 134, 254, 128
 , 128, 128, 224, 224, 224
 H 2600 DATA -1

SOFTBALL STATISTICS FOR ATARI ST

What's the worst position on a softball team? Catchers have to squat in an uncomfortable stance for an hour or more and duck hazardous foul balls. Pitchers have to duel with mighty sluggers and dodge powerful line drives. First basemen have to stretch their bodies like rubber bands to nab wayward throws from their teammates while keeping at least one toe on the base bag. And outfielders have to scoop up bouncing grounders with the knowledge that no one is backing them up except the outfield fence.

But as demanding as all these positions are, there's another that could be worse—that of team statistician. Keeping track of your teammates' performance is often a laborious, thankless job. Sometimes the statistician is a reserve player or friend of the team who doesn't even get to play. Caged in the dugout, the statistician is supposed to document every hit, run, and walk, and boost team morale by contributing lively chatter. After the game, the statistician has to spend hours punching numbers into a calculator to figure out every one else's batting average.

"Softball Statistics" makes that job much easier. After each game, the program prompts you to enter

Roger Felton

"Softball Statistics" makes it easy to keep track of all the individual and team results for your favorite team. You can enter data for each player's times at bat, hits, runs, and so on. The program automatically computes batting averages, stores cumulative results on disk as the season progresses, generates formatted printouts with sorted rankings for all players, and more. The program was originally written for the eight-bit Atari and adapted for several other computers in the July 1985 issue of COMPUTE!. This new version runs in medium- or high-resolution modes on any Atari ST with the TOS operating in ROM. An 80-column printer is optional but recommended.

vital stats for each player. Then it automatically calculates the batting averages and prints sorted rankings on the screen or printer. It can also print sorted rankings for hits, runs, and runs batted in. These game statistics can then be merged with data

for all previous games, and updated season results can be sorted by category and printed. Finally, the program lets you store the cumulative statistics on disk.

If you're a fan of professional or Little League baseball, you can use Softball Statistics to follow the fortunes of your favorite team. And with modifications, it could be adapted to a wide variety of sports.

Preparing The Program

Be extra careful when typing Softball Statistics because a mistyped line could yield inaccurate results even if the program runs without errors. Save a copy on disk for safekeeping before running it the first time.

Before using the program, you have to prepare it by entering your team's roster. Softball Statistics can handle a team with up to 20 players and stores this information in DATA statements as part of the program itself. If you're keeping stats for more than one team, you'll have to keep a separate copy of the program for each team.

The DATA statements for player information begin at line 2300. The statements must conform to a predefined format: a two-digit jersey number followed by a space, then the player's first or last name.

Precede one-digit jersey numbers with a zero, such as 08 for 8. Names can be any length, but only the first seven characters appear on the printouts. Each entry is separated by a comma. Example:

2300 DATA 23 LEE,17 JACKSON,33
JOHNSTON,10 LONGSTREET,04
PICKETT

(In the output, JOHNSTON and LONGSTREET would appear as JOHNSTO and LONGSTR.)

The programs are listed with dummy entries in the DATA statements, such as 44 Jim and 10 PLAYERX. Substitute your own team members for these entries. If your team has fewer than 20 players, leave the remaining dummy entries in the DATA statements but substitute the name PLAYERX; the program must have 20 entries to function, and it ignores the PLAYERX entries.

Finally, put your own team's name in the TM\$ string statement at line 190. Softball Statistics is now ready to run.

Important note: You should avoid tinkering with the player name DATA statements once you've started using the program. Otherwise, there will be problems when it attempts to compute cumulative season totals. If you drop a player from the roster and replace him with another player, the new player's totals will contain the old player's results as well. To drop a player, substitute a PLAYERX dummy entry at that position in the DATA statement. Of course, this means the dropped player's results will no longer be included in the team totals for the season. If you wish to retain a dropped player's results in the team totals, leave the player's name in the DATA statement and enter 999 in response to all input prompts for that player's stats following subsequent games (see below).

Compiling Statistics

Once the roster is entered, you can run the program. It begins by asking for statistics for individual games. The first prompt asks:

Who did you play?

Respond with the opposing team's name—such as Ham's Diner—and press RETURN. The next prompt reads:

Figure 1: Printout of Team Game Stats

ROSTER IS SORTED BY BATTING AVERAGE

#	PLAYER	AB	RUNS	HITS	RBI	2B	3B	HR	BB	Avg
09	MARTY	6	2	5	3	2	1	1	0	0.833
03	JOHN	5	2	4	2	2	0	1	1	0.800
55	MIKE	4	1	3	1	1	0	1	0	0.750
44	JIM	5	4	3	1	2	0	0	0	0.600
08	KEN	4	1	2	1	1	1	0	0	0.500
08	BOB	6	3	3	2	2	0	0	2	0.500
22	PETE	5	1	2	2	0	0	0	0	0.400
07	BILL	5	1	2	0	1	0	0	0	0.400
06	BARRY	6	2	2	0	1	0	0	3	0.333
	TOTALS	46	17	26	12	12	2	3	6	0.565

Enter your score and their score (separated by a comma):

For instance, if your team lost by a score of 9 to 5, you'd type 5,9 and press RETURN.

The program now begins asking for individual player statistics. If the first player name on your roster is Kevin, the program prints Kevin's statistics for this game:

and then prompts you, one by one, to enter the number of times at bat, runs scored, hits, runs batted in (RBIs), doubles, triples, home runs, and walks. At each prompt, type the appropriate number and press RETURN. After the last prompt, the program asks:

Is everything OK (Y/N)?

If you made any mistakes while entering the current player's stats, press N. You'll be given a chance to reenter the numbers.

When all the player's statistics

are correct, press Y at the prompt. The program continues to the next player on the roster and repeats the cycle.

If a certain player missed a game, type 999 at the first prompt. This automatically enters zeros for all his stats and skips to the next player. In fact, entering 999 at any prompt inputs zeros for all of a player's remaining game stats.

Individual Printouts

After you type the last statistic for the last player, the program prints the message WORKING while it sorts all the data. (The WORKING message appears at other points in the program during sorts, since the sort routine is written in BASIC and is not particularly fast.) In a few moments, the program says:

Do you want a printout of the game's stats (Y/N)?

Type Y for yes or N for no. If

Figure 2: Printout of Slugging Stats

HITS SORT: RBIS SORT: RUNS SORT:

#	PLAYER	HITS	#	PLAYER	RBIS	#	PLAYER	RUNS
09	MARTY	5	09	MARTY	3	44	JIM	4
03	JOHN	4	03	JOHN	2	08	BOB	3
55	MIKE	3	22	PETE	2	03	JOHN	2
44	JIM	3	06	BOB	2	06	BARRY	2
08	BOB	3	44	JIM	1	06	BARRY	2
06	BARRY	2	55	MIKE	1	55	MIKE	1
08	KEN	2	08	KEN	1	08	KEN	1
22	PETE	2	07	BILL	0	22	PETE	1
07	BILL	2	06	BARRY	0	07	BILL	1
	TOTAL HITS	26		TOTAL RBIS	12		TOTAL RUNS	17

you press N, the program asks if you want to input data for another game. If you press Y, it asks:

To screen or printer (S/P)?

Type S or P. Softball Statistics then prints the individual stats for all team members for that game, sorted in descending order by batting averages (see Figure 1). To pause the printout, press the left mouse button. You can resume after pausing by pressing the space bar.

Next, the program asks:

Do you want a sorted printout of hits, RBIs, and run leaders (Y/N)?

Again, type Y for yes or N for no. If you type N, the program asks if you want to input stats for another game. If you answer Y, it asks again if you want the output directed to the screen or printer, and then prints sorted rankings for the various slugging categories for that game (see Figure 2). As before, you can stop the output by pressing the left mouse button and restart it by pressing the space bar.

Finally, the program asks:

Do you want to input stats from another game (Y/N)?

Usually you type N at this prompt unless you're entering results of more than one game. If you type Y, the program repeats the entire process described above.

Season Totals

Softball Statistics makes it easy for you to tabulate running totals for the entire season by storing game results on disk. After you've entered and viewed the stats for the most recent game, the program asks:

Would you like to merge in data for the year (Y/N)?

The first time you run Softball Statistics, of course, you won't have any previous data on disk, so you'd answer N, skipping to the next prompt. During subsequent runs, you'd answer Y to merge in data for the year. The program then requests a filename for the disk data file and merges these existing stats with the results you've entered for the latest game or games.

Season totals are then computed automatically, and the program asks:

Do you want a printout of the year's stats (Y/N)?

Figure 3: Printout of Season Totals

STATISTICS FOR THE YEAR:
RECORD FOR THE YEAR: WINS:2 LOSSES:1

ROSTER IS SORTED BY BATTING AVERAGE

#	PLAYER	AB	RUNS	HITS	RBI	2B	3B	HR	BB	Avg
03	JOHN	16	18	11	11	5	4	2	3	.688
06	BARRY	18	12	11	8	4	1	4	5	.611
07	BILL	17	19	18	7	3	3	3	2	.588
55	MIKE	18	18	18	18	5	3	1	4	.556
44	JIM	18	9	9	7	5	2	1	2	.500
08	BOB	17	12	8	7	4	1	2	1	.471
09	MARTY	17	10	8	8	4	2	3	4	.471
22	PETE	17	7	6	4	3	1	1	3	.353
08	KEN	17	6	6	7	3	1	2	4	.353
TOTALS		155	86	79	71	36	18	19	28	.518

If you answer Y, the program asks if you want output directed to the screen or printer, and then prints season totals for all players. This printout includes the team's win-loss record and sorts players in descending order by batting averages (see Figure 3).

Afterward, the program asks if you want sorted printouts for hits, RBIs, and runs—again, based on season totals (these charts resemble those in Figure 2). Finally, the program gives you the opportunity to save the updated data file on disk until the next game.

If you typed N after the previous prompt, the program asks:

Do you want to save the data (Y/N)?

If you answer Y, the program asks for a filename for the updated data file, saves the file, and then ends.

Softball Computing

If you're interested in programming, you can learn a lot by studying Softball Statistics because it's written in straight BASIC with no machine language. In fact, the input and output routines beginning at lines 2350 and 2470 are general enough to be adapted to your own programs.

You don't have to be a programmer, though, to appreciate Softball Statistics. If you're a softball statistician, no longer do you have the worst position on the team. Maybe it's the shortstop....

Softball Statistics For Atari ST

Version By George Miller, Assistant Technical Editor

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing In Programs" in this issue of COMPUTE!.

```
10  TITLES=" Softball Statist
11  ICS="CHR$(0)
12  LPS=SPACE$(2)+"# PLAYER"+ 
13  SPACE$(4)+"AB"+SPACE$(3)
14  LPS=LPS+"RUNS"+SPACE$(2)+ 
15  "HITS"+SPACE$(3)+"RBI"+SPA
16  CES$(3)
17  LP$=LP$+"2B"+SPACE$(4)+"3
18  B"+SPACE$(4)+"HR"+SPACE$(4)
19  "+BB"+SPACE$(4)+"AVG"
20  GOSUB CLEARIT
21  IF PEEK(SYSTAB+0) <> 4 TH
22  EN 140
23  PRINT " SOFTBALL STATIST
24  ICS"
25  PRINT " REQUIRES A MEDIUM
26  OR HI RESOLUTION"
27  PRINT " SCREEN :PRINT
28  PRINT " PLEASE USE THE CO
29  NTROL PANEL"
30  PRINT " TO RESET RESOLUTI
31  ON BEFORE"
32  PRINT " CONTINUING."
33  END
34  GOSUB CLEARIT:GOSUB TITLE
35  BAR
36  D5$=5
37  D6$=2
38  PL$=20
39  DIM B$(9),CC(20),IN(21),ST
40  (8),RT(20,8),TT(20,8),F$(21)
41  J,NA$(20),R$(21)
42  TMS$="Sundogs"
43  C$="0000"
44  FOR I=1 TO 8
45  READ F$(1)
46  NEXT I
47  FOR J=1 TO PL
48  READ NA$(J)
49  NEXT J
50  FOR J=1 TO TT
51  READ R$(J)
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53  FOR I=1 TO 8
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981  READ R$(I)
982  NEXT I
983  FOR I=1 TO 20
984  READ CC(I)
985  NEXT I
986  FOR I=1 TO 21
987  READ TMS$(I)
988  NEXT I
989  FOR I=1 TO 8
990  READ F$(I)
991  NEXT I
992  FOR I=1 TO 20
993  READ NA$(I)
994  NEXT I
995  FOR I=1 TO 21
996  READ R$(I)
997  NEXT I
998  FOR I=1 TO 8
999  READ CC(I)
1000  NEXT I
1001  FOR I=1 TO 20
```

```

330 NEXT I
340 NEXT J
350 GOSUB CLEARIT:GOTO XY 5,10
:PRINT "Do you want to:":P
PRINT
360 PRINT SPACE$(20); "1) Enta
r new statistics."
365 PRINT SPACE$(20); "2) Ravi
ew disk file"
370 A = INP(2)
380 IF A = ASC("1") THEN 410
390 IF A = ASC("2") THEN 3530
400 GOTO 370
410 GOSUB CLEARIT:PRINT "GAME
STATISTICS"
420 PRINT:PRINT "Who did you
play"
430 INPUT OT$:
440 PRINT:PRINT "Enter your s
core and their score (sepa
rated by a comma)"
450 INPUT Y$,TS
460 W=W+AB$(Y$)S$TS
470 L=L+AB$(TS)S$YS
480 FOR J=1 TO PL
490 IF MIDS$(NAS$(J),4,7)<>"PLA
YERX" THEN 520
500 R$(J)=R$(J)*"00000000000000000000
00000000000000000000.000"
510 GOTO 730
520 GOSUB CLEARIT
530 PRINT MIDS$(NAS$(J),4,LEN(N
AS$(J))):"s statistics for
this game:"
540 FOR I=1 TO 8
550 B(I)=0
560 PRINT F$(I);TAB(14);
570 INPUT BC(I)
580 IF LEN(STR$(BC(I)))>=55 TH
EN 550
590 IF BC(I)<>9999 THEN 640
600 FOR K=1 TO 8
610 BK(K)=0
620 NEXT K
630 I=8
640 NEXT I
650 PRINT:PRINT"Is everything
OK (Y/N) ?"
660 A$ = CHR$(INP(2))
670 IF A$ = "N" OR A$ = "n" T
HEN 520
680 GOSUB BUILDR
690 FOR I=1 TO 8
700 RT(J,I)=RT(J,I)+B(I)
710 TT(J,I)=TT(J,I)+B(I)
720 NEXT I
730 NEXT J
740 GOSUB WORKING
750 MM=0
760 FOR I=1 TO 8
770 FOR J=1 TO PL
780 ST(I)=ST(I)+TT(J,I)
790 NEXT J
800 B(I)=ST(I)
810 NEXT I
820 R$(J)=""
830 GOSUB BUILDR
840 TT$=TT(J)
850 GOSUB AVERAGE:GOSUB CLEAR
IT
860 PRINT "Do you want to imp
ut statistics from another
game (Y/N) ?"
870 GOSUB GETKEY
880 IF A$ = "Y" OR A$ = "y" T
HEN 280
890 GOSUB CLEARIT
900 PRINT "Would you like to
merge in data for the year
(Y/N) ?"
910 GOSUB GETKEY
920 IF A$ = "Y" OR A$ = "n" T
HEN 960
930 GOSUB CHECKFILE
940 W=SW+W
950 L=SL+L
960 GOSUB WORKING
970 FOR J=1 TO PL
980 FOR I=1 TO 8
990 IF AS$="N" OR AS$="n" OR MI
HEN 1040
1000 B(I)=VAL(MIDS$(R$(J),11+(I
-1)*4,4))
1010 BC(I)=RT(I,J)+B(I)
1020 RTC(J,I)=BC(I)
1030 GOTO 1050
1040 BC(I)=RT(J,I)
1050 ST(I)=0
1060 NEXT I
1070 R$(J)=MIDS$(R$(J),1,10)
1080 GOSUB BUILDR
1090 NEXT J
1100 MM=1
1110 FOR I=1 TO 8
1120 FOR J=1 TO PL
1130 ST(I)=ST(I)+RT(J,I)
1140 NEXT J
1150 BC(I)=ST(I)
1160 NEXT I
1170 R$(J)=""
1180 GOSUB BUILDR
1190 TT$=TT$(J)
1200 GOSUB CLEARIT
1210 PRINT "Do you want a prin
tout of the year's statisti
cs (Y/N) ?"
1220 GOSUB GETKEY
1230 IF A$ = "N" OR A$ = "n" T
HEN 1260
1240 GOSUB WORKING
1250 GOSUB AVERAGE:GOSUB CLEAR
IT
1260 PRINT "Do you want to SAV
E the data (Y/N) ?"
1270 GOSUB GETKEY
1280 IF A$ = "Y" OR A$ = "y" T
HEN 1300
1290 END
1300 GOTO WRITEFILE
1310 '
1320 SHELL:
1330 FOR J=1 TO PL
1340 IN(J)=J
1350 CCC(J)=VAL(MIDS$(R$(J),BB,E
))
1360 NEXT J
1370 FOR J=PL-1 TO 1 STEP -1
1380 FOR I=1 TO J
1390 IF CCC(IN(I))>CCC(IN(I+1))
THEN 1430
1400 TE=IN(I)
1410 IN(I)=IN(I+1)
1420 IN(I+1)=TE
1430 NEXT I
1440 NEXT J
1450 RETURN
1460 '
1470 BUILDR:
1480 IF BC(I)=0 THEN 1510
1490 IF BC(3)>0 THEN 1510
1500 GOTO 1540
1510 B(9)=0
1520 AV$="0.000"
1530 GOTO 1550
1540 B(9)=INT(B(3)/B(1)*1000+.
5)/1000+.0001
1550 FOR I=1 TO 8
1560 B$=STR$(BC(I))
1570 B$=MIDS$(C$,1,15-LEN(B$))+
MIDS$(B$,D6,LEN(B$))
1580 R$(J)=R$(J)+B$"
1590 NEXT I
1600 IF B(9)<0 THEN 1660
1610 AV$=STR$(B(9))
1620 IF MIDS$(AV$,1,1)<>". " THE
N 1640
1630 AV$=MIDS$(AV$,2,6)
1640 IF MIDS$(AV$,1,1)<>". " THE
N 1680
1650 AV$="0"+AV$
1660 R$(J)=R$(J)+MIDS$(AV$,1,5)
1870 RETURN
1880 '
1890 AVERAGE:
1700 BB=43
1710 E=5
1720 GOSUB SHELL
1730 IF MM=1 THEN 1770
1740 GOSUB CLEARIT
1750 PRINT "Do you want a prin
tout of the game's statisti
cs (Y/N) ?"
1760 GOSUB GETKEY
1770 IF A$ = "N" OR A$ = "n" T
HEN 1810
1780 GOSUB PRINTOPT
1790 IF DE = 1 THEN GOSUB SCRE
ENPRINT:GOTO 1810
1800 IF DE = 2 THEN GOTO LINEP
RNT
1810 RETURN
1820 '
1830 WORKING:
1840 PRINT
1850 PRINT " WORKING... "
1860 RETURN
1870 '
1880 PRINT
1890 PRINT "Do you want sorted
printouts of hits, RBIs's,
and run leaders (Y/N) ?"
1900 GOSUB GETKEY
1910 IF A$ = "N" OR A$ = "n" T
HEN 1940
1920 GOSUB PRINTOPT
1930 GOTO 1950
1940 RETURN
1950 GOSUB WORKING
1960 BB=19
1970 E=4
1980 GOSUB SHELL
1990 I=3
2000 IF DE = 1 THEN GOSUB TOSC
REEN ELSE GOSUB TOLINEPTR
2010 BB=23
2020 GOSUB SHELL
2030 I=4
2040 IF DE = 1 THEN GOSUB TOSC
REEN ELSE GOSUB TOLINEPTR
2050 BB=15
2060 GOSUB SHELL
2070 I=2
2080 IF DE = 1 THEN GOSUB TOSC
REEN ELSE GOSUB TOLINEPTR
2090 RETURN
2100 '
2110 GETKEY:
2120 A$ = CHR$(INP(2))
2130 IF A$ = "N" OR A$ = "n" O
R A$ = "Y" OR A$ = "y" THE
N RETURN ELSE 2120
2140 RETURN
2150 '
2160 PRINTOPT:
2170 PRINT
2180 PRINT "To screen or print
er (S/P) ?"
2190 A$ = CHR$(INP(2))
2200 IF A$ = "S" OR A$ = "s" T
HEN DE = 1:GOTO 2220
2210 IF A$ = "P" OR A$ = "p" T
HEN DE = 2 ELSE 2190
2220 RETURN
2230 '
2240 CLEARIT:
2250 CLEAR 2:FULLW 2:GOTO XY 0
2260 RETURN
2270 '
2280 DATA Times at Bat,Runs,H
its,RBI's,Doubles,Triples,H
ome Runs,Walks
2290 REM LIST PLAYERS BY NUMBE
R & NAME
2300 DATA 01 Kevin,02 Tom,03 P
atrick,04 Eddie,05 Gregg
2310 DATA 06 George,07 David H
,08 David F.,09 Selby,10

```

```

Mark
2320 DATA 11 Neal, 12 Byron, 13
2330 DATA 14 John, 15 Leon
2340 DATA 16 David K, 17 Mike, 1
8 PLAYERX, 19 PLAYERX, 20 PL
AYERX
2350 REM INPUT ROUTINE
2360 CHECKFILE:
2370 ON ERROR GOTO 2600
2380 GOSUB CLEARIT
2390 PRINT "Name for data file"
;:INPUT FFS
2400 OPEN "1", #1, FF#
2410 INPUT #1, SW, SL
2420 FOR J=1 TO PL
2430 INPUT #1, R$(J)
2440 R$(J)=MID$(NA$(J), 1, LEN(NA$(J)))+SPACE$(10-LEN(NA$(J)))+R$(J)
2450 NEXT J:CLOSE #1:RETURN
2460 '
2470 WRITEFILE:
2480 GOSUB CLEARIT:
2490 PRINT "Name of data file t
o write":INPUT FFS
2500 OPEN "0", #1, FF#
2510 PRINT#1, L
2520 PRINT#1, L
2530 FOR J = 1 TO PL
2540 PRINT #1, MID$(R$(J), 11, 3
2)
2550 NEXT J
2560 CLOSE #1
2570 END
2580 '
2590 CHECKERROR:
2600 IF ERR = 53 THEN 2620
2610 PRINT "Error Number ";ERR
;:at line":ERL:END
2620 PRINT "File not found on
disk drive specified."
2630 CLOSE 1
2640 RESUME 2390
2650 '
2660 SCREENPRT:
2670 GOSUB CLEARIT:PRINT:IF MM
=1 THEN TS="THE YEAR":GOTO
2690
2680 TS="THIS GAME"
2690 PRINT "STATISTICS FOR "TS
";":IF MM=1 THEN GOTO 2710
2700 PRINT TM$" VS "OT$" Sc
ore: "YS"=TS:GOTO 2720
2710 PRINT "RECORD FOR THE YEA
R: Wins:"W" Losses:"L
2720 PRINT :PRINT "Roster is s
orted by batting average":
PRINT
2730 PRINT LPS
2740 FOR J=1 TO PL:GOSUB PAUSE
2750 IF MID$(R$(IN(J)), 4, 7)="P
AYERX" THEN 2830
2760 PRINT SPACE$(1):MID$(R$(I
N(J)), 1, 10):SPACE$(1):
2770 FOR I = 1 TO B:O=0:FOR K=0
TO 3
2780 IF MID$(R$(IN(J)), 11+(I-1
)*4+K, 1) < "0" THEN O=1
2790 IF MID$(R$(IN(J)), 11+(I-1
)*4+K, 1)>"0" AND O=0 AND K
=3 THEN PRINT "0":GOTO 28
2800 '
2810 IF MID$(R$(IN(J)), 11+(I-1
)*4+K, 1)>"0" AND O=0 THEN
PRINT "1":GOTO 2820
2820 PRINT MID$(R$(IN(J)), 11+(I
-1)*4+K, 1)
2830 NEXT J:PRINT :PRINT " TOT
ALS":SPACE$(5):
2840 FOR I=1 TO B
2850 O=0:FOR K=1 TO 4:IF MID$((
TT$, (I-1)*4+K, 1) < "0" TH
EN O=1
2860 IF MID$(TT$, (I-1)*4+K, 1)=
"0" AND O=0 AND K=4 THEN P
RINT "0":GOTO 2890
2870 IF MID$(TT$, (I-1)*4+K, 1)=
"0" AND O=0 THEN PRINT SPA
CE$(1):GOTO 2890
2880 PRINT MID$(TT$, (I-1)*4+K,
1)
2890 NEXT K:PRINT SPACE$(2):N
EXT I:PRINT SPACE$(1):MID$(
TT$, 33, 5)
2900 PRINT :GOTO 1880
2910 '
2920 TOSCREEN:
2930 PRINT :IT=0:PRINT :PRINT F
$(1)" SORT":PRINT
2940 PRINT "# "PLAYER":space$(6
):$1:FOR J=1 TO PL:GOS
UB PAUSE
2950 IF MID$(R$(IN(J)), 4, 7)="P
AYERX" THEN 3020
2960 PRINT MID$(R$(IN(J)), 1, 10
):SPACE$(4):
2970 O=0:FOR K=0 TO 3:IF MID$(R
$(IN(J)), BB+K, 1) < "0" T
HEN O=1
2980 IF MID$(R$(IN(J)), BB+K, 1)
="0" AND O=0 AND K=3 THEN
PRINT "0":GOTO 3010
2990 IF MID$(R$(IN(J)), BB+K, 1)
="0" AND O=0 THEN PRINT SP
ACE$(1):GOTO 3010
3000 PRINT MID$(R$(IN(J)), BB+K
, 1):IF K=3 THEN PRINT
3010 NEXT K:T=VAL(MID$(R$(IN
(J)), BB, E))
3020 NEXT J:PRINT :PRINT "TOTA
L " ;$1:SPACE$(5):T
3030 PRINT :RETURN
3040 '
3050 LINEPRNT:
3060 LPRINT:IF MM=1 THEN TS="TH
E YEAR":GOTO 3080
3070 TS="THIS GAME"
3080 LPRINT "STATISTICS FOR "T
S":":IF MM=1 THEN GOTO 310
0
3090 LPRINT TM$" VS "OT$" S
CORE: "YS"=TS:GOTO 3110
3100 LPRINT "Record for the ye
ar: Wins:"W" Losses:"L
3110 LPRINT :LPRINT "Roster is s
orted by Batting Average
":LPRINT
3120 LPRINT LPS
3130 FOR J=1 TO PL:GOSUB PAUSE
3140 IF MID$(R$(IN(J)), 4, 7)="P
AYERX" THEN 3220
3150 LPRINT SPACE$(1):MID$(R$(I
N(J)), 1, 10):SPACE$(1):
3160 FOR I = 1 TO B:O=0:FOR K=0
TO 3
3170 IF MID$(R$(IN(J)), 11+(I-1
)*4+K, 1) < "0" THEN O=1
3180 IF MID$(R$(IN(J)), 11+(I-1
)*4+K, 1)>"0" AND O=0 AND K
=3 THEN LPRINT "0":GOTO 3
210
3190 IF MID$(R$(IN(J)), 11+(I-1
)*4+K, 1)>"0" AND O=0 THEN
LPRINT "1":GOTO 3210
3200 LPRINT MID$(R$(IN(J)), 11+
(I-1)*4+K, 1)
3210 NEXT K:LPRINT SPACE$(2):N
EXT I:LPRINT SPACE$(1):MID$(
R$(IN(J)), 43, 5)
3220 NEXT J:LPRINT :LPRINT " TO
TALS":SPACE$(5):
3230 FOR I=1 TO B
3240 O=0:FOR K=1 TO 4:IF MID$((
TT$, (I-1)*4+K, 1) < "0" TH
EN O=1
3250 IF MID$(TT$, (I-1)*4+K, 1)=
"0" AND O=0 AND K=4 THEN L
PRINT "0":GOTO 3280
3260 IF MID$(TT$, (I-1)*4+K, 1)=
"0" AND O=0 THEN LPRINT SP
ACE$(1):GOTO 3280
3270 LPRINT MID$(TT$, (I-1)*4+K
, 1):
3280 NEXT K:LPRINT SPACE$(2):N
EXT I:LPRINT SPACE$(1):M
D$(TT$, 33, 5)
3290 LPRINT:GOTO 1880
3300 '
3310 TOLINEPTR:
3320 LPRINT :T=0:LPRINT :LPRIN
T F$(1)": SORT":LPRINT
3330 LPRINT "# "SPACE$(2+":PLA
YER":SPACE$(6):$1:FOR J
=1 TO PL:GOSUB PAUSE
3340 IF MID$(R$(IN(J)), 4, 7)="P
AYERX" THEN 3410
3350 LPRINT MID$(R$(IN(J)), 1, 1
0):SPACE$(4):
3360 O=0:FOR K=0 TO 3:IF MID$(R
$(IN(J)), BB+K, 1) < "0" T
HEN O=1
3370 IF MID$(R$(IN(J)), BB+K, 1)
="0" AND O=0 AND K=3 THEN
LPRINT "0":GOTO 3400
3380 IF MID$(R$(IN(J)), BB+K, 1)
="0" AND O=0 THEN LPRINT S
PACE$(1):GOTO 3400
3390 LPRINT MID$(R$(IN(J)), BB+
K, 1):IF K=3 THEN LPRINT
3400 NEXT K:T=VAL(MID$(R$(IN
(J)), BB, E))
3410 NEXT J:LPRINT :LPRINT "TO
TAL " ;F$(1):SPACE$(5):T
3420 LPRINT:RETURN
3430 '
3440 PAUSE:
3450 IF PEK($HFFFC02) > 0 THE
N 3450 ELSE RETURN
3460 '
3470 TITLEBAR:
3480 A# = GB : GINTIN = PEEK(A
#+B)
3490 POKE GINTIN+0, PEEK(SYSTAB
+8): POKE GINTIN+2, 2
3500 S# = GINTIN+4 : TITLE$ =
TITLES + CHR$(0)
3510 POKE S#, VARPTR(TITLE$) :
GEMSYS(105)
3520 RETURN
3530 REVIEW:
3540 GOSUB CHECKFILE
3550 W=SW+W
3560 L=SL+L
3570 GOSUB WORKING
3580 FOR J=1 TO PL
3590 FOR I=1 TO 8
3600 IF A$="N" OR A$="n" OR MI
D$(NA$(J), 4, 7)="PLAYERX" T
HEN 3620
3610 B()=VAL(MID$(R$(J), 1, 1+(I
-1)*4, 4))
3620 B(1)=RT(J, 1)+B(1)
3630 RT(J, 1)=B(1)
3640 GOTO 3660
3650 B(1)=RT(J, 1)
3660 STC(1)=0
3670 NEXT J
3680 R$(J)=MID$(R$(J), 1, 10)
3690 GOSUB BUILOR
3700 NEXT J
3710 MM=1
3720 FOR I=1 TO B
3730 FOR J=1 TO PL
3740 STC(1)=STC(1)+RT(J, 1)
3750 NEXT J
3760 B(1)=STC(1)
3770 NEXT I
3780 R$(J)=""
3790 GOSUB BUILOR
3800 TT#=R$(J)
3810 GOSUB CLEARIT
3820 GOSUB WORKING
3830 GOSUB AVERAGE:GOSUB CLEAR
IT
3840 END

```

Reviews

Toshiba P321 Printer

Tim Victor, Editorial Programmer



Requirements: Any compatible computer with the appropriate interface.

A few years ago it was easy to spend a lot of money for a computer printer and still not get top-of-the-line quality. Unless you were satisfied with a 40-column thermal printer, you generally had to lay out several hundred dollars just to get a relatively crude dot-matrix printer, and a good daisy wheel printer cost over \$1,000.

Today, many good dot-matrix and daisy wheel printers are available for a couple of hundred dollars. But both technologies have their particular strengths, and which one you ultimately choose should depend on the applications you have in mind. Daisy wheel printers necessarily have limited graphics capabilities, though they offer letter-quality type. Inexpensive dot-matrix printers can produce decent graphics, but are restricted in print quality by their nine-pin printheads, which gener-

ally don't produce letter-quality type or crisp graphics (though some have very respectable near-letter-quality modes).

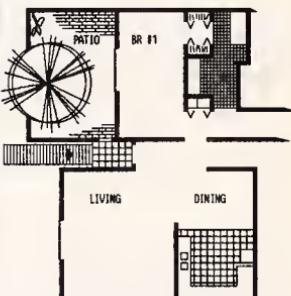
Dot-matrix printers that use a 24-pin printhead are capable of far superior graphics and text, but have in the past been relatively expensive. Toshiba has introduced the P321, also called the 3-in-1 Printer, a 24-pin printhead dot-matrix printer that retails for \$699. The nickname 3-in-1 refers to the printer's combination of speed, letter quality type, and graphics. The quality of its output approaches that of laser printers which cost at least three times as much.

More Typeset Than Typewritten

Three different typefaces are built into the printer: Courier, Elite, and draft-quality. It can also hold two more typefaces in a cartridge and download one more from the computer, so its output is very flexible.

Draft mode is quite readable and

extremely fast. The manufacturer claims 216 characters per second at 12 characters per inch and 180 cps at 10 cpi in this mode; letter quality runs at 72 cps. For listing computer programs or making quick dumps of a large amount of data, this printer performs extremely well. The Toshiba P321 can also produce proportionally spaced printing—allowing more space for wide letters like *w* than for narrow ones like *i*. When this feature is used, the printed output appears even and smooth, looking more like typeset-quality print than typewritten text.



This illustrates the graphics capabilities of the Toshiba P321.

```
:DRAW:CALL FROM BASIC, 3 PARM
S
:INCLUDED: # OF SHAPE,
:HPPOS(PIXELS), VPOS(PIXELS)
:
:DRAW LDA #2 ,ORG0
STA NUMBYTES
:
:LOA #24 :ORG1
STA ROWCOUNT
:
:JSR ADDSHAPE ;WHICH SHAPE?
BCS ERROR
JSR GETHPOS :WHERE?
BCS ERROR
JSR GETVPOS
BCS ERROR
:
:LDA THISHSHAPE ;COPY ADDR TO Z
P
STA PATTERN
LOA THISHSHAPE+1
STA PATTERN+1
:
:DRAWLOOP JSR CALC ;SCRN ADDR
```

Draft mode on the P321.

The P321 can plot graphics with a resolution of 180 by 180 dots per inch. Although dots can be positioned with a horizontal resolution of 1/360 inch, two dots can't occupy adjacent positions. Unfortunately, it can't emulate Epson graphics. Epson was one of the first companies to offer an inexpensive printer that could produce graphics, and its graphics command set has since become an unofficial industry standard. While some newer software can produce graphics output for the P321, nearly every program that prints graphics can drive an Epson. If this feature had been included, Toshiba users would have enjoyed compatibility with a wider range of programs.

The Noise Factor

Laser printers are promoted as being quiet as a whisper. Naturally, the P321 isn't nearly that quiet. The noise level probably won't be offensive. But if you work in a quiet office, or if you compute at home and keep late hours, you might

find the noise somewhat disturbing. It's not the loudest dot-matrix printer we've heard, but it might be loud enough to cause problems in some situations.

If you've previously been unsatisfied with near-letter-quality dot-matrix printers, the Toshiba P321 deserves consideration. The characters it produces look a little heavier than those made by a typewriter or a daisy wheel printer, but certainly better than the majority of dot-matrix printers we've seen. And when the Toshiba uses proportional spacing, its output looks better than what a typewriter could produce.

Toshiba P321 Printer
Toshiba America, Inc.
Information Systems Division
2441 Michelle Drive
Tustin, CA 92680
\$699 (parallel only)
\$749 (parallel and serial)
IBM Emulation Kit \$49
Downloadable Type Font Kit \$99

down the Mississippi River on the *Delta Princess*. You are accompanied by your constant companion, Regis Phelps. While exploring the rooms on the ship, you come across a dead body and must enlist the help of passengers and crew members to find out who is the murderer. You have three days to solve the crime.

The game is entirely joystick-controlled; no keyboard commands are necessary. To move around the decks, to climb up and down stairs, and to enter rooms, you control the character by moving the joystick up, down, right, and left. It may take a few tries to maneuver your character into the exact spot that will make the door open, but it's not too tough.

The cabins themselves are not very big, so movement within them is rather restricted. If you're trying to get Sir Charles and Regis and a passenger to leave a room together, you sometimes get something of a Three Stooges effect—you keep bumping into each other as well as furniture and doors. But this tends to be amusing rather than irritating.

A Unique Interface

Adam Bellin has designed a unique user interface to allow interaction with the passengers. After you've entered a room, the character who resides there introduces himself or herself in response to your greeting. Pushing the joystick button will give you a menu: You can *Walk around*, *Inspect*, *Examine evidence*, *Talk to* (passenger's name), or return to the main menu. A small hand icon on the right side of the screen points to the selection highlighted, and pressing the joystick button activates that command.

If you choose to talk to the passenger, you're given another menu: *Tell me about*, *What do you know about this evidence?*, *Please follow me*, *Share notes with*, *Accuse*, or *Previous menu*. Information gathering is essential to solving the crime, so each passenger should be questioned, even if it leads nowhere. You can ask passengers to talk about themselves and about the victim.

After receiving information, Regis will ask if you'd like the notebook to take notes. If you think the information is important, you can choose to save certain key words from the passenger's speech. You're only allowed one line from each speech (generally 5-10 words), so choose carefully. Quite often, that's not enough, so you may want to take supplementary notes on paper. That's a good idea in the beginning, anyway, as it will help you keep track of who's staying in which room.

As you select highlighted words to

Murder On The Mississippi For Commodore And Apple

Kathy Yakal, Assistant Features Editor

Requirements: Commodore 64 or Apple II-series computer with at least 64K RAM. Joystick required. Disk only.

Murder On The Mississippi, designed by Adam Bellin and published by Activision, is a rich, enjoyable adventure game. You're plunged into a convincing, complex world—a riverboat traveling down the Mississippi sometime in the 19th century. Though there is a lot to explore within that setting, it's not so huge and meandering that you get lost every time you make a move or have to keep retracing your steps. A cast of charming, eccentric characters makes you feel welcome in this imaginary world, and you *cannot* get killed five minutes into the game. In these and other ways, *Murder On The Mississippi* is free of the disagreeable aspects which reduce the fun of some other adventure games.

If you've ever played a poorly designed adventure game, the experience may have been frustrating enough to put you off the whole genre entirely. It seems that there are three areas in which many text-only or text-and-graphics adventures can miss the mark. First, some of them create a rather small world, or at least make it appear that way. As hard as you try, you can't get more than about ten minutes into the

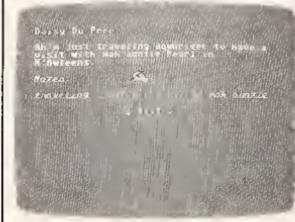
game without having to give up because you keep going around in circles. Second, some games have the nasty habit of allowing you to get into situations where you are easily killed, forcing you to start all over again. Finally, even if a game is playable, it may not have the feel of a real world. It's extremely difficult to create an environment and a set of characters with which you can easily and believably interact. And that is key to a good adventure game.

Trouble On The Delta Princess

On the other hand, a dedicated hardcore player of more traditional adventure games like Infocom's all-text *Zork* series may not find *Murder On The Mississippi* much of a challenge. Some people prefer to imagine what a game's world looks like, and aren't bothered by the hours it can take just to figure out how to move around and interact without getting killed. But for those who enjoy solving a murder mystery without bumping around in the dark, *Murder On The Mississippi* provides an entertaining, interactive environment in which to do just that.

As the player, you portray Sir Charles Foxworth, a famous British sleuth who is taking a three-day cruise

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be added to the notebook, an onscreen hand writes out the words in Sir Charles's handwriting. That's a nice touch, the kind of thing that surprises and delights a seasoned computer game player and makes computer games appealing to new users. *Murder On The Mississippi* contains many such thoughtful elements. Though the characters don't require a lot of depth in a game like this to make the game engaging, each is carefully drawn through the use of background, dialogue, and even accents. And Regis is an endearing fellow from the start—he's always following right on the heels of Foxworth, who appears to stand about two feet taller than his devoted sidekick.

Four Endings

In your early exploration of the ship, you'll discover that several of the rooms are locked. Finding out how to enter them merely takes some common sense, as does deciding what kind of evidence to pick up and keep for later examination. Getting to the point where you can actually start to draw some conclusions about the case will take some time and thought.

If you don't solve the mystery in one sitting (and you probably won't), you can save the game and later pick up where you left off. And there are four possible endings, so once you've solved the game, you can start over again and work your way through a new set of clues.

Murder On The Mississippi
Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
\$34.95 (Commodore)
\$39.95 (Apple)

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Three Fantasy Games For Commodore And Apple

James V. Trunzo

Requirements: Commodore 64 or 128 (in 64 mode), or an Apple II-series computer with at least 64K RAM. Disk only.

The old axiom that good things come in threes certainly applies to a trio of new entertainment programs from Strategic Simulations, Inc. The wizards at SSI have conjured up three new fantasy titles that are sure to please all the would-be warriors who sit by their computers, anxious to explore another dungeon, slay another dragon, or banish another demon. And while on the surface it might appear to be unsound business strategy for a company to release three new monster and magic programs simultaneously, SSI succeeds because each game is unique in its approach and play. The three games, *Rings of Zilfin*, *Phantasia II*, and *Wizard's Crown*, will provide fantasy lovers with enough challenges to last the entire summer.

The first game, *Rings of Zilfin*, differs from other games of its kind by offering a nearly perfect hybrid of arcade action, role playing, and animation. The player controls a single character who has a variety of combat skills as well as latent magical ability. This ability must be developed during the course of the adventure in order to survive and complete your quest: You must reclaim the Rings of Zilfin and the fabulous Treasure of Fulgarsh.

Pay Attention To The Plants

The entire game is animated. Your keyboard-controlled character marches step by step across a huge mapped area. When he enters towns, dungeons, and so on, the program uses windowing to display the interiors and the options permitted. There's arcade-style combat as well.

But your character is not the typical warrior-hero. *Rings of Zilfin* requires a thorough understanding of strategy, economics, and diplomacy. You need to pay special attention to mushrooms and plants because these items can offer important assistance. And, in addition to monsters, your personal will encounter elves, dwarfs, kings, beggars, witches, and wizards. Some are helpful, others deadly. Reading and rereading the well-written manual is a must; it contains necessary information as well as hidden clues.

This is a rich simulation. The realm of Batiniq contains three nations, 27

towns, two dungeons and more; there are over 100 inhabitants with whom to converse, and dozens of plants, magical pools, and monsters with which to contend—and all phases of the game are animated. The game has a flavor all its own. If you are a fantasy buff and you're looking for something a little different, *Rings of Zilfin* might be the game for you.

If you would enjoy something a little more traditional (and if you are one of the many who became addicted to the award-winning *Phantasia* game), you'll certainly want to get your hands on *Phantasia II*. The sequel does not require you to have played *Phantasia*, but if you have conquered the first *Phantasia* game, you can transfer your battle-trained characters to the new adventure.

Phantasia II has all the same features of its predecessor. Assembling a party of up to six characters, you must explore a vast wilderness, dungeons, Astral Planes and—new this time around—two levels of the Netherworld. Your group, made up of any mixture of fantasy types, must battle over 80 different monsters, gather treasure and magical artifacts, and improve its abilities as it attempts to defeat, once again, the arch-sorceror Nikademus.

The Hidden Undead

Phantasia II employs full screen graphics, animated combat, maze-like dungeons (which are mapped by the computer, incidentally), and a wide variety of terrains.

If you've played the original *Phantasia*, you can look forward to new features like molten lava, which is extremely dangerous; mist, which shrouds areas and hides such enemies as the undead and swarms of insects; and dark voids, which hold unknown horrors that must be faced by your group.

Also, a new wrinkle has been added to the combat phase of *Phantasia II*. Characters can now choose to toss rocks at enemies in any rank, with accuracy and damage determined by the appropriate skill level of the character.

A Most Unusual Game

The third game, *Wizard's Crown*, is the most difficult of the three and probably the most unusual fantasy game to hit the market in some time. Requiring 50 to 100 hours of playing time, *Wizard's Crown* comes very close in flavor to the

actual *Dungeons and Dragons* role-playing game which started the fantasy craze. One reason for this is that each member of the party of adventurers can be controlled separately.

Also, the combat can be tactical in nature. Each character can select from 10 to 20 combat options, more than one in a given turn in most cases. For example, a warrior could improve his accuracy by aiming at an enemy prior to attacking. Characters can dodge and zigzag, attack defensively, stand on guard, load a bow or crossbow, move in any direction, or ready a new weapon—to name only a few of the options.

This control over individual movement allows the players to form a wide variety of defensive formations when in combat and also to take advantage of the battleground terrain. Because of the large number of combat variables that come into play—rear and flank attacks, for example—the combat is far closer to a typical war game than is usual in fantasy games.

Combat fought in the above manner can take anywhere from 10 to 20 minutes to complete, and all combat maneuvers are animated by highly detailed character icons. But if you're in a hurry, *Wizard's Crown* offers a quick combat option, too.

Especially Lifelike

Characters in *Wizard's Crown* have many more characteristics and skills than are usual in a game of this type. Combat awareness, ability to track, skill at administering first aid, knowing how to read ancient writings, and ability to use alchemy are some of the more esoteric ratings given characters in *Wizard's Crown*. These are in addition to the typical skills of a thief, wizard, or warrior. The various combination of skills add greatly to the personality and individuality of the characters, making them seem especially lifelike.

Your quest, to recover the coveted *Wizard's Crown*, takes your group of adventurers through streets, buildings, dense wilderness, and, of course, dungeons. During the course of your adventure, you will encounter dozens of monsters, find merchants with whom you can trade or sell your loot, bribe innkeepers for rumors and clues that will help you complete your quest, and acquire an almost limitless variety of magical items like lightning swords and rings of invisibility.

Wizard's Crown also includes five levels of difficulty, two kinds of combat, and works with one or two disk drives. Add this to all the other options, plus the excellent animation and graphics, and you have a game that will excite and challenge even the most seasoned

veteran of fantasy warfare.

SSI has created a triad of adventure games that offer something for everyone. Each program has its own special challenges and each requires a different strategy. One of them is sure to suit your taste; which one is up to you. You can't make a bad choice, though, because all three games are winners.

Rings of Zilfin
Phantasia II
Wizard's Crown
Strategic Simulations, Inc.
883 Sierlin Road
Mountain View, CA 94043
\$39.95 each

Brattacus

Charles Brannon, Program Editor

Requirements: Atari ST with color monitor, Commodore Amiga, or Apple Macintosh.

We've come a long way from the days of the original Adventure game. There are many variations in the genre of interactive fiction: text only, text and graphics, and graphics only. The text-only adventure games, best known by Infocom's Zork series and other interactive fiction such as *The Hitchhiker's Guide to the Galaxy*, depend on detailed prose and a sophisticated parser which decodes the typed commands you give to your invisible alter ego. To explore the adventure world, you type commands like GO WEST or TAKE ME TO YOUR LEADER. The game responds by changing the scene, giving you a new page of text to read, or responding with a message like CAN'T GO IN THAT DIRECTION, or CAN'T TAKE THE 'ME'. The latter kind of message reveals the limitations of command parser. The parser thinks you are trying to TAKE (pick up) the object ME.

This kind of adventure game can sometimes be frustrating, since only a limited number of actions make sense in any one scene. You are basically solving a series of linked or nested puzzles. For instance, you may start by trying to find a scroll that reveals the location of a magic key, which in turn opens the locked door that leads to the treasure you'll need to bribe a gatekeeper. In addition to a bribe, the gatekeeper may insist that you solve a knotty riddle before passing into the domain of a wizard who holds the ultimate object of your quest. Until you solve the gatekeeper's riddle, you can't enter that portion of the adventure world.

The text-only games make you feel

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you're reading a complex novel in which you are the main character. You help "write" the story by making decisions at various branching points. However, there isn't enough room on the screen or in computer memory for both elaborate text and detailed color illustrations.

Adventure games that use both text and graphics rely on full-screen pictures to tell much of the story. While text-only games like *Zork* must describe a room, a graphics adventure like *Sierra On-Line's King's Quest* shows you the room itself, including whatever objects it contains. You still use keyboard commands to control the action, but the pictorial approach is one step closer to a real-life simulation.

Onscreen Alter Ego

Brattacus is part of a new trend in adventure games in which you control a realistic image of a human or some other character. Instead of typing GO WEST, you move a mouse or a joystick, making your onscreen character walk around, open and close doors, pick up and put down objects, and even fight when necessary. In *Brattacus*, the action takes place on a high-resolution stage of platforms, elevators, cantinas, police headquarters, and the criminal underworld. *Brattacus* provides much of the interaction of text-only adventure games, but gives you direct, real-time control.

It takes some time to learn to control your character, a genetic engineer named Kyne. In addition to four basic directions, you can modify these four movements to get many more. In the Atari ST and Amiga versions, for example, you can push the mouse to the left, or push to the left with the right mouse button down, or even with both buttons pressed. Usually, your character behaves in a predictable fashion, but it can be frustrating to see him run and crash into a wall when you were merely trying to rotate to face a door.

In the game, Kyne has developed a new genetic technique for creating superhuman beings. The government, however, won't allow such a powerful, destabilizing technology to run rampant (at least, unless it controls the technology, with a race of supersoldiers foremost in mind). As Kyne, you have been falsely charged with selling your secrets to the underworld and are on the run, seeking out the seedy mining asteroid Brattacus, where you believe you can find evidence to clear your name. The criminal underworld of *Brattacus* is not unaware of the potential of your discoveries, so they too are hunting you. Fortunately, you are traveling under an alias, but there is a bartender

who can blow your cover.

This would make for a great science-fiction film, and you become the star of the show. You walk Kyne's character around the maze of the asteroid's structure, wandering in and out of bars, floating up and down in elevators, moving from room to room, sometimes talking or fighting with other characters. Some characters let you know they are going to the bar for a drink, a cue for you to follow them for a private talk. These semi-autonomous characters roam throughout *Brattacus* in rather aimless fashion. There are several classes of characters, from planetoid personnel and police to the henchmen of the criminal mastermind Kol Worp.

Once in the bar, the characters ask if you'd like any information, usually in exchange for money or goods which are littered about the planetoid, ready to be plucked up by you or others. You respond to a character's prompt by choosing one of several responses that appear in a thought bubble above Kyne's head. Your choice affects the future of the game.

Realistic Swordplay

At times, you need to draw your sword to defend yourself against attackers. You can duck, parry, and lunge with your sword, but don't walk around with it drawn, since many characters take such behavior as a provocation. Characters whom you kill do not merely disappear, but instead lie on the ground for the rest of the game as a gruesome reminder. The game's graphics are realistic, and some players may object to this violent aspect.

Since many characters in *Brattacus*—especially the police and henchmen—are excellent swordsmen, you'll find that games don't last long if you get carried away with swordplay. Swords, incidentally, are the only permissible weapons on Brattacus, since other weapons could rupture the air bubble that keeps everyone alive on this desolate asteroid.

The world of *Brattacus* is complex and difficult to map. In it you'll find security cameras that scan key corridors; you don't want to be caught fighting on camera. On/off switches let you control the operation of elevators, video screens, and more, but using them is a crime. Some rooms contain tannoy (loudspeakers) that periodically announce special police bulletins. Video screens display special news alerts. There are times where you'll be arrested and dragged off to jail, or captured by thugs and hauled away to an audience with the evil Kol Worp. You must balance chit-chat, bribery, and measured doses of swordplay to keep

things under control.

I don't know if *Brattacus* is solvable. Although I've played it for weeks, it's still very hard to grasp all the elements needed to solve the puzzle and find the evidence. In this manner, *Brattacus* is no different from other adventure games, which may take months to complete. For many people, this indicates good value, since the game still poses an interesting challenge even after considerable use.

Unrealized Potential

The only negative factors arise not from the game concept, but from its implementation. *Brattacus* was first designed on the Atari 520ST, and the program's routines for moving the large objects representing characters can get bogged down when there are many characters on the screen at once. When *Brattacus* was translated for the Amiga and Macintosh, apparently it was not rewritten to take advantage of these computers' features.

For instance, the Amiga's blitter chip, which could significantly speed up the animation, does not seem to be utilized to its potential. The game graphics are absolutely identical on both machines. And curiously, though the Amiga works with the same type of joystick as the ST, joystick control is absent from the Amiga version. Also, the Amiga version makes no use of the Amiga's integral speech synthesis.

The Macintosh version's graphics are somewhat disappointing, too. The designers converted the ST color graphics without taking advantage of the greater vertical resolution on the Mac. As a result, the Macintosh version has only 200 lines of vertical resolution and looks squashed compared to the original.

Nevertheless, *Brattacus* shows the possibilities for gameplay on powerful 68000-based computers such as the ST, Amiga, and Macintosh. As designers continue to learn more about these machines, we can expect new waves of entertainment software which take advantage of the powerful CPU, large-capacity disks, digital sound, and elaborate screen graphics that make these computers so attractive.

Brattacus

Mindscape, Inc.

3444 Dundee Road

Northbrook, IL 60062

\$49.95

©

Sprite 32

For Commodore 64

Jeremy Zullo

This sophisticated utility allows the Commodore 64 to display as many as 32 sprites on the screen at the same time. (It also works on the Commodore 128 in 64 mode.) The "Sprite BASIC" enhancement program adds several new sprite commands to BASIC 2.0. For machine language programmers, the "Sprite Kernal" utility offers the same capabilities for ML programming. Demonstration programs show how to use the technique in both BASIC and machine language. A disk drive is required.

You probably know that the Commodore 64 is designed to display a maximum of eight sprites on the screen at one time. That's enough for most purposes, but there are many situations, particularly in game programming, where extra sprites would be useful. The programs accompanying this article let you display as many as 32 sprites on the screen at once. Though the programs are written in machine language, you can use them without being a machine language expert.

"Sprite 32" is the first program you'll need; it handles the mechanics of displaying the extra sprites. The second utility, a BASIC enhancement called "Sprite BASIC," adds nine new sprite commands to the 64's BASIC 2.0. The third ML program, called "Sprite Kernal," offers a convenient way for machine language programmers to access all of the Sprite 32 functions.

Getting Started

Begin by entering Programs 1, 2, and 3. Because these programs are written in machine language, you must enter them with the "MLX" machine language entry program listed elsewhere in this issue. Before you type in the programs, read the information below about which file-

names to use when saving them. If you don't intend to program in machine language, you need not type in Program 3; however, you may want to enter it anyway to view the machine language demonstration (see below). Here are the addresses you need to enter each program with MLX:

Program 1

Starting address: C000
Ending address: C4C7

Program 2

Starting address: C600
Ending address: C997

Program 3

Starting address: C600
Ending address: C80F

If you wish to use the demo programs included with this article, you must save Programs 1, 2, and 3 with the exact filenames listed here:

Program 1: SPRITE 32
Program 2: SPRITE BASIC
Program 3: SPRITE KERNAL

After you've saved Programs 1-3, you may want to enter Program 4, the BASIC demonstration. Before entering this program, however, you must activate Sprite BASIC. Load the program with the command LOAD "SPRITE BASIC" ,8,1. When the load is finished, enter NEW to reset the computer's memory pointers, then type SYS 50688 and press RETURN to install Sprite BASIC. It is very important that you install Sprite BASIC before typing in Program 4. If you omit this step, the program will not work correctly.

After Sprite BASIC is installed, enter Program 4. Don't worry about the unfamiliar commands; they'll be explained in the next section. Save a copy of the program, then run it. After loading Sprite 32 and Sprite BASIC, the program displays 32 sprites on the screen, LISTs itself, and returns to ready mode.

Note that Sprite 32 works com-

pletely in the background: The sprites remain stable even after the READY prompt and blinking cursor reappear. You can LIST the program, edit it, and with one exception (see below) use BASIC in the normal way.

BASIC Demo

Let's examine some Sprite BASIC commands. With 32 sprites still on the screen, type this statement and press RETURN:

SPRITE 0

All of the sprites disappear. Now enter the command SPRITE 1: All of the sprites instantly reappear.

The SPRITE command turns the Sprite 32 utility on and off. This command is important because you must always disable Sprite 32 before using the disk or tape drive. If you try to save or load a program while Sprite 32 is still active, you may crash the system (no harm is done to the computer, but you might lose whatever program is in memory).

Here are some additional commands to try. Type in each of the lines listed here, pressing RETURN at the end of each line:

FOR J=0 TO 7:DISABLE 3,J:NEXT
ENABLE 3,0
FOR J=1 TO 7:ENABLE 3,J:NEXT

The ENABLE and DISABLE commands let you turn individual sprites on and off. The first number after the command indicates the sprite's group number. There are four sprite groups, numbered 0-3. Each group contains eight sprites, and group 0 is always located at the top of the screen. Within each group, sprites are numbered from 0-7; in this demo, sprite 0 is at the leftmost screen position.

The second parameter in the ENABLE and DISABLE commands identifies which sprite within the group you wish to affect. Thus, DISABLE 3,0 turns off sprite 0 in

group 3 (the bottom group). ENABLE 2,7 turns on the rightmost sprite in group 2, and so on.

Horizontal Zones

Sprite 32 divides the screen horizontally into four separate zones, one for each group of eight sprites. When all 32 sprites are on the screen, each group is confined to its own horizontal zone. For example, you cannot move a group 3 sprite into the zone for group 2. However, by sacrificing sprites from other zones, you can allow a sprite to move freely through two or more zones. The basic method is to DISABLE the corresponding sprite in the next higher-numbered zone.

For instance, if you disable sprite 0 in group 3, then sprite 0 in group 2 can move anywhere within zones 2 and 3. By sacrificing three corresponding sprites, you can allow a sprite from group 0 to go anywhere on the screen. To illustrate, enter these lines, pressing RETURN at the end of each line:

```
FOR J=1 TO 3:DISABLE J:NEXT
FOR J=60 TO 250:PLACE 0,0,30,J:NEXT
FOR J=250 TO 60 STEP -1:PLACE
  0,30,J:NEXT
```

Sprite 0 from group 0 moves all the way down through zones 1, 2, and 3, then returns to its original position. While this method reduces the total number of sprites you can display, it does permit you to have some sprites that aren't confined to particular screen areas.

One word of warning: Do not disable any of the sprites in group 0, or you may get unpredictable results.

Sprite BASIC Commands

Here is a list of all the Sprite BASIC commands:

DISABLE sprite group,sprite number Turn off a sprite. The *sprite group* parameter can range from 0-3 and identifies which of four groups the sprite belongs to. The *sprite number* can range from 0-7 and identifies an individual sprite within the group (see above).

ENABLE sprite group,sprite number Turn on the sprite specified by *sprite group* and *sprite number* (see above).

KILL Deactivate Sprite BASIC. After you perform KILL, Sprite

BASIC is disabled and the 64's BASIC works exactly as usual. This is not the same as a SPRITE 0 statement (see below), which disables the Sprite 32 utility but does not affect Sprite BASIC.

OFF sprite group,sprite number Make the designated sprite invisible. Use the PUTS command (see below) to make a sprite visible again. Note the difference between OFF and DISABLE: An OFF statement makes the sprite disappear from the screen but has no effect on the ability of other sprites to venture into that sprite's zone. A DISABLE statement allows another sprite to move through the disabled sprite's territory and also makes the sprite disappear.

PLACE sprite group,sprite number,X coord,Y coord Place the designated sprite at the screen coordinates indicated by *X coord* and *Y coord*. The horizontal coordinate *X coord* can be any value from 0-512, but only coordinates from 24-343 are visible on the screen. The vertical coordinate *Y coord* can be any value from 0-255, but only coordinates from 50-249 are visible on the screen. (No special tricks are required to move sprites past the "seam" into horizontal positions greater than 255; Sprite 32 automatically handles the most significant bit for horizontal positioning.)

PUTS sprite group,sprite number The opposite of OFF, this statement makes a sprite visible.

RASTL boundary number,new raster The RASTL (RASTER Line) statement lets you change the boundary between two sprite zones; since the zones are contiguous, this also changes the size of those zones. The first parameter, *boundary number*, identifies which zone boundary you wish to change. There are three boundaries, numbered 0-2, which separate the four sprite zones. Boundary 0 separates zones 0 and 1; boundary 1 separates zones 1 and 2; and boundary 2 separates zones 2 and 3.

The second parameter, *new raster*, specifies the raster line where the specified boundary should be located. The visible screen contains 200 raster lines, numbered 50-249, with line 50 at the very top of the screen. The de-

fault position for boundary 0 is raster line 99. To move this boundary 20 lines higher on the screen (to line 79), use the statement RASTL 0,79. Now the lower portion of zone 0 ends at screen line 79 and the upper portion of zone 1 begins at line 80.

SET sprite group,sprite number,shape,color SET defines the shape and color of the individual sprite specified by *sprite group* and *sprite number*. The *shape* parameter tells the 64 where to find the shape data for the sprite. This is the same value you would POKE into one of the shape pointer locations from 2040-2047 under normal circumstances. The *color* value can range from 0-15 and corresponds to the usual 64 color numbers (color 0 is black, and so forth). Your user's manual contains more information about colors and sprite shape pointers.

SPRITE toggle Turn Sprite 32 on or off. Because Sprite 32 interferes with disk and tape operations (including saving and loading programs), you must always turn it off before using disk or tape. Use SPRITE 0 to deactivate Sprite 32, and SPRITE 1 to activate it. This statement does not affect Sprite BASIC, which must always be active in order to use a program that contains Sprite BASIC commands. For instance, after loading Sprite BASIC into memory, Program 4 activates it with SYS 50688 before performing any Sprite BASIC commands.

Programming Tips

When placing sprites on the screen, keep in mind that no part of the sprite can cross the boundaries of its zone unless you have DISABLED other sprites to permit multizone movement.

For example, the default location for zone 0 is from raster lines 0-99. Since a sprite can be as many as 21 lines high, you should not attempt to PLACE a group 0 sprite using a vertical coordinate greater than 78 (99-21=78). Similarly, zone 1 stretches from lines 100-149, so a zone 1 sprite can move between lines 100-128 (149-21=128). If you try to position a sprite outside its permitted zone, it may flicker or disappear completely. Within its horizontal

zone, a sprite can have any horizontal location.

There are certain aspects of sprite behavior which Sprite 32 doesn't affect at all. For instance, sprite-to-sprite display priorities are exactly the same as usual: When two or more sprites overlap, lower-numbered sprites always appear in front of higher-numbered ones.

You may change the sprite-to-background priority of a sprite in the usual way, but the change affects every sprite of the same number. That is, if you change the sprite/background priority for sprite 0, it is changed for sprite 0 in every sprite group.

The same is true of horizontal or vertical expansion. Expansion affects every like-numbered sprite on the screen.

Machine Language Demo

For machine language programming, BASIC commands are not particularly convenient. Program 3, the Sprite Kernal, provides all the features of Sprite 32 to machine language programmers. Even if you don't understand machine language, you may want to enter and run the remaining programs to see an impressive demonstration. Program 5 illustrates the power of machine language by moving 17 sprites on the screen simultaneously. This program must be entered with MLX, using these addresses:

Starting address: 6000

Ending address: 62B7

If you have been using Sprite 32 or Sprite BASIC, turn the computer off and on before you load and run MLX. Be sure to save Program 5 with the filename ML DEMO.

Next, type in and save Program 6 (you do not have to install Sprite BASIC before typing this program). This is a short BASIC loader that installs the necessary ML programs in memory, then starts ML DEMO with the statement SYS 24576.

When you run Program 6, the screen fills immediately with 17 bouncing sprites. Note that several of the sprites move through more than one sprite zone; one of them, the light blue sprite, is able to move anywhere on the screen. As explained earlier, it is necessary to



"Sprite 32" allows the Commodore 64 to display as many as 32 sprites on the screen simultaneously.

sacrifice a certain number of sprites to achieve this effect.

Press RUN/STOP-RESTORE to stop the program. To restart it, enter SYS 24576.

The Sprite Kernal

Like Sprite BASIC, the Sprite Kernal also requires that Sprite 32 be in memory. Here are the starting addresses for each Sprite Kernal routine:

Routine	JSR address
SPRITE	\$C612/50706
PLACE	\$C615/50709
SET	\$C618/50712
OFF	\$C61B/50715
PUTS	\$C61E/50718
DISABLE	\$C621/50721
ENABLE	\$C624/50724
RASTL	\$C627/50727

The Sprite Kernal routines perform the same functions as their Sprite BASIC equivalents. However, a different procedure is used to pass each routine the information it needs. The basic method is to store the parameters in memory locations beginning at 50688 (\$C600), then call the Sprite Kernal routine with JSR. For an explanation of the parameters required by each routine, see "Sprite BASIC Commands" above.

Since the SPRITE routine takes only one parameter (1 or 0), you need to supply only one value before calling it. For example, to perform the equivalent of the Sprite BASIC statement SPRITE 1, you would execute LDA #1:STA \$C600:JSR \$C612. To do the equivalent of SPRITE 0, use LDA #0:STA \$C600:JSR \$C612. All of the remaining Sprite Kernal routines require two or more parameters. Here is an outline of how to call them:

PLACE (\$C615/50709) Store the

sprite group value in \$C600/50688 and the sprite number value in \$C601/50689. Locations \$C602-\$C603/50690-50691 hold the low byte and high byte of the sprite's horizontal (X) position. Store the sprite's vertical (Y) position in location \$C604/50692.

SET (\$C617/50712) Store the sprite group value in \$C600/50688 and the sprite number value in \$C601/50689. Store the shape pointer value in \$C602/50690 and the color value in \$C603/50691.

OFF (\$C61B/50715) Only two values are required. Store the sprite group value in \$C600/50688 and the sprite number value in \$C601/50689.

PUTS (\$C61E/50718) The converse of OFF. Store the sprite group value in \$C600/50688 and the sprite number value in \$C601/50689.

DISABLE (\$C621/50721) Only two values are required. Store the sprite group value in \$C600/50688 and the sprite number value in \$C601/50689.

ENABLE (\$C624/50724) The converse of DISABLE. Store the sprite group value in \$C600/50688 and the sprite number value in \$C601/50689.

RASTL (\$C627/50727) Store the boundary number value in \$C600/50688 and the new raster value in \$C601/50689.

Here is a short example of how to use Sprite Kernal routines. This program displays sprite 4 in group 2. You will need a machine language assembler to create the object code for this routine. The comments following the semicolons are optional and need not be included.

```
LDA #$01 ;turn on
STA $C600 ;Sprite 32
JSR $C612
LDA #$04 ;sprite number
STA $C600
LDA #$02 ;sprite group
STA $C601
LDA #$A0 ;low and high
STA $C602 ;bytes of the
LDA #$00 ;sprite's
STA $C603 ;X coordinate
LDA #60
STA $C604 ;Y coordinate
JSR $C615 ;PLACE
RTS
```

When Sprite 32 is active, the 64's IRQ vector is diverted from its normal address to the custom routines used to display extra sprites. If

you activate another interrupt-driven routine at the same time, the conflict may produce unexpected results.

Program 1: Sprite 32

Please refer to the "MLX" article in this issue before entering the following listing.

```
C000:4C A7 C0 00 00 00 00 00 00 A9
C000:00 00 00 00 45 45 45 45 45 98
C010:45 45 45 45 00 01 02 03 8D
C018:04 05 06 07 00 01 02 03 19
C020:04 05 06 07 00 00 00 00 16
C028:00 00 00 00 00 00 77 77 77 ED
C030:77 77 77 77 77 00 01 02 71
C038:03 04 05 06 07 00 01 02 79
C040:03 04 05 06 07 00 00 00 7D
C048:00 00 00 00 00 00 A9 A9 C6
C050:A9 A9 A9 A9 A9 A9 00 01 D5
C058:02 03 04 05 06 07 00 01 B9
C060:02 03 04 05 06 07 00 00 C0
C068:00 00 00 00 00 00 00 DB C5
C070:DB DB DB DB DB 00 16
C078:01 02 03 04 05 06 07 00 E9
C080:01 02 03 04 05 06 07 01 F2
C088:01 01 01 01 01 01 01 01 0A
C090:01 01 01 01 01 01 01 01 12
C098:01 01 01 01 01 01 01 01 FF 19
C0A0:FF FF 64 96 C8 FA 78 AE
C0A8:A9 1B 8D 11 D0 A9 81 8D 46
C0B0:1A D0 A9 C3 8D 14 03 A9 51
C0B8:C0 8D 15 03 A9 7F 8D 0D 44
C0C0:DC 58 60 A9 01 8D 19 D0 AE
C0C8:AD 12 D0 CD A3 C0 96 03 E0
C0D0:4C A8 C1 AD 00 C8 8D 10 3C
C0D8:AD 9F C0 8D 15 D0 AD 3E
C0E0:03 C0 8D 00 D0 AD 00 C0 C0
C0E8:8D 01 D0 AD 14 C0 8D 27 4C
C0F0:D0 AD 1C C0 8D F8 07 AD E1
C0F8:04 C0 8D 02 D0 AD 00 C0 96
C100:8D 03 D0 AD 15 C0 8D 28 EE
C108:AD 1D C0 8D F9 07 AD 1F
C110:05 C0 8D 04 D0 AD 00 C0 52
C118:8D 05 D0 AD 16 C0 8D 29 9E
C120:D0 AD 1E C0 8D FA 07 AD 58
C128:06 C0 8D 06 D0 AD 00 C0 00
C130:8D 07 D0 AD 17 C0 8D 2A 32
C138:AD 01 F0 C0 8D FB 07 AD 97
C140:07 C0 8D 08 D0 AD 16 C0 C7
C148:8D 09 D0 AD 18 C0 8D 2B D3
C150:AD 00 AD 20 C0 8D FC 07 AD D3
C158:08 C0 8D 00 D0 AD 11 C0 82
C160:8D 0B AD 19 C0 8D 2C 75
C168:D0 AD 21 C0 8D FD 07 AD 10
C170:09 C0 8D 0C D0 AD 12 C0 3D
C178:AD 00 D0 AD 1A C0 8D 2D 17
C180:AD 22 C0 8D FE 07 AD 4C
C188:0A C0 8D 0E D0 AD 13 C0 F7
C190:8D 0F D0 AD 1B C0 8D 2E B8
C198:AD 23 C0 8D FF 07 AD 88
C1A0:A3 C0 8D 12 D0 4C B6 C4 E2
C1A8:CD A4 96 03 04 AD C4 C4
C1B0:AD 2C C0 8D 10 D0 AD A0 C6
C1B8:C0 8D 15 D0 AD 87 C0 FA AD
C1C0:18 AD 24 C0 8D 00 D0 AD 00
C1C8:2D C0 8D 01 D0 AD 35 C0 3D
C1D0:8D 27 D0 AD 3D C0 8D F8 DA
C1D8:07 AD 88 C0 8F 18 AD 25 D0
C1E0:C0 8D 02 D0 AD 2E C0 8D AA
C1E5:03 D0 AD 36 C0 8D 28 D0 98
C1F0:AD 3E C0 8D F9 07 AD 89 9C
C1F6:C0 F0 18 AD 26 C0 8D 00 4A
C200:AD 00 AD 2F C0 8D 05 D0 AD 1B
C208:37 C0 8D 29 D0 AD 3F C0 1A
C210:8D FA 07 AD 8A C0 F0 18 2B
C218:AD 27 C0 8D 06 D0 AD 30 2E
C220:C0 8D 07 D0 AD 38 C0 8D 8A
C228:2A D0 AD 40 C0 8D FB 07 EB
C230:AD 8B C0 F0 18 AD 28 C0 1F
```

```
C238:8D 08 D0 AD 31 C0 8D 09 2C
C240:00 D0 AD 39 C0 8D 2B D0 AD 35
C248:41 C0 8D FC 07 AD 8C C0 E8
C250:0F 18 AD 29 C0 8D 0A D0 RD
C258:AD 32 C0 8D 0B D0 AD 3A 63
C260:C0 8D 2C D0 AD 42 C0 8D C1
C268:FD 07 AD 8D C0 F0 18 AD E4
C270:2A C0 8D 0C D0 AD 33 C0 12
C278:8D 00 D0 AD 3B C0 8D 2D 22
C280:00 AD 43 C0 8D FE 07 AD 72
C288:5E C0 F0 18 AD 2B C0 8D 4E
C290:0E D0 AD 34 C0 8D 0F D0 75
C298:AD 3C C0 8D 2E D0 AD 44 49
C2A0:C0 8D FF 07 AD A4 C0 8D 69
C2A8:12 D0 4C B6 C4 CD A5 C0 C9
C2B0:09 C0 8D 03 C0 8D B2 C3 AD 04 24
C2B8:AD 10 D0 AD A1 C0 8D 15 3E
C2C0:00 AD 8F C0 F0 18 AD 45 A0
C2C8:C0 8D 00 D0 AD 4E C0 8D 84
C2D0:01 AD 56 C0 8D 27 D0 81
C2D8:5E C0 8D F8 07 AD 90 8D
C2E0:C0 8F 18 AD 46 C0 8D 02 33
C2E8:D0 AD 4F C0 8D 03 D0 AD FF
C2F2:00 C0 8D 28 D0 AD 5F C0 43
C2F8:AD F9 07 AD 91 C0 F0 18 09
C300:AD 47 C0 8D 04 D0 AD 50 30
C308:C0 8D 00 D0 AD 58 C0 8D DE
C310:29 D0 AD 60 C0 8D FA 07 55
C318:AD 92 C0 F0 18 AD 48 C0 0B
C320:8D 06 D0 AD 51 C0 8D 07 94
C328:AD 59 C0 8D 2A D0 AD 1F
C330:61 C0 8D FB 07 AD 93 C0 E0
C338:0F 18 AD 49 C0 8D 08 D0 A5
C340:AD 52 C0 8D 09 D0 AD 5A 65
C348:00 8D 2B D0 AD 62 C0 8D 0C
C350:FC 07 AD 94 C0 F0 18 AD BE
C358:14 C0 8D 0A D0 AD 53 C0 2C
C360:00 D0 AD 58 C0 8D 2C 88
C368:D0 AD 63 C0 8D 00 00 00
C370:95 C0 8F 18 AD 48 C0 8D 3C
C378:0C D0 AD 54 C0 8D 00 D0 5C
C380:AD 53 C0 8D 2D D0 AD 64 53
C388:C0 8D FE 07 AD 96 C0 0F 5E
C390:18 AD 4C C0 8D 00 D0 AD 19
C398:55 C0 8D 0F D0 AD 5D C0 56
C3A0:8D 2E D0 AD 65 C0 8D FF B8
C3A8:07 AD A5 C0 8D 12 D0 4C 82
C3B0:B6 C0 AD C0 90 03 C0 83
C3B8:1C AD 46 C0 8D 00 00 00
C3C0:AD 2C C0 8D 15 D0 AD 97 97
C3C8:C0 F0 18 AD 66 C0 8D 00 01
C3D0:00 AD 6F C0 8D 01 D0 AD E5
C3D8:77 C0 8D 27 D0 AD 7F C0 6D
C3E0:8D FA 07 AD 98 C0 F0 18 EA
C3E8:AD 67 C0 8D 02 D0 AD 70 31
C3F0:00 8D 03 D0 AD 78 C0 8D 08
C3F8:2B AD 8D AD C0 8D F9 07 BD
C400:AD 99 C0 F0 18 AD 68 C0 F6
C408:BD 04 D0 AD 71 C0 8D 00 05
C410:00 AD 79 C0 8D 29 D0 AD 09
C418:81 C0 8D FA 07 AD 9A C0 D8
C420:F0 18 AD 69 C0 8D 06 D0 8D
C428:AD 72 C0 8D 07 D0 AD TA 67
C430:0C 8D 2A D0 AD 82 C0 8D 56
C438:FB 07 AD 98 C0 F0 18 AD 98
C446:0A C0 8D 08 D0 AD 73 C0 46
C448:BD 09 D0 AD 78 C0 8D 2B F4
C450:00 AD 83 C0 8D FC 07 AD 46
C458:9C C0 F0 18 AD 6B C0 8D 2A
C460:0A D0 AD 74 C0 8D 0B D0 43
C468:7D C0 8D 2C D0 AD 84 5D
C470:00 C0 8D FD 07 AD 9D C0 F4
C478:18 AD 6C C0 8D 0C D0 AD FE
C480:75 C0 8D 00 D0 AD 7D C0 70
C488:5D 2D D0 AD 85 C0 8D F6 62
C490:00 AD 9E C0 F0 18 AD 6D 99
C498:C0 8D 0E D0 AD 76 C0 8D 0B
C500:0F D0 AD 7E C0 8D 2B D0 EC
C508:AD 86 C0 8D FF 07 4C B1 02
C510:AD 49 00 8D 12 D0 AD 01 C
C488:1D 29 01 F0 03 C0 31 C0 E0
C4C0:4C BC FE 00 00 00 00 00 7F
```

Program 2: Sprite BASIC

Please refer to the "MLX" article in this issue before entering the following listing.

```
C600:A2 07 BD 04 03 9D A7 02 78
C608:BD 12 C6 9D 04 03 C0 10 7D
C610:F1 60 5F C6 E3 C6 18 C7 39
C618:3A C7 4B 49 4C CC 53 45 34
C620:D4 4F 46 46 D3 50 54 C5 80
C630:45 4E 41 42 4C C5 50 4C A6
C638:41 43 C5 52 41 53 54 CC E1
C640:53 50 52 49 54 C5 4C F0 C0
C648:4F C0 08 C7 83 C8 BD D4
C650:C8 E7 C0 08 C2 02 C9 A7 88
C658:C7 56 C9 6C C9 6C C7 20 07
C669:7C A5 A2 00 00 04 84 0F 17
C668:BD 00 02 85 08 C9 22 F0 0A
C670:4F 24 0F 70 26 C9 41 90 03
C678:22 C9 5B B0 1E 84 71 A0 86
C680:4C 84 00 02 F0 FF 86 7A C9 9A
C688:C8 E8 BD 00 02 38 F9 1A 6B
C690:C8 F9 F5 C9 80 D0 30 05 C5
C698:0B A4 71 B8 C9 99 FB 01 37
C6A0:B9 FB 01 F0 36 38 9V 3A D9
C6A8:F6 04 C9 49 D0 02 85 0F 05
C6B0:38 E9 55 D6 C8 85 0B 0D 0E
C6B8:00 02 F0 DF C5 00 F0 DB EE
C6C9:C8 99 F0 01 BD 00 F0 A6 B0 0A
C6C8:7A E6 C8 B9 19 C6 10 0B
C6D0:FB B9 1A C6 D0 B4 BD 00 CE
C6D8:02 1B 0E 99 FD 01 A9 FF 24
C6E0:85 7A 60 10 2A C9 FF 00 F0 46
C6E8:26 24 0F 30 22 C9 CC 90 D9
C6F0:24 38 E9 CB AA 84 49 A0 33
C6F8:FF CA F0 00 C9 B9 1A C6 F6
C700:10 FA 30 F5 C8 B9 1A C6 E3
C708:38 0B 28 47 AD 0B F5 C4 03
C710:F3 A6 4C EF AD 64 C1 A7 0E
C718:20 73 00 C9 CC 90 15 20 24
C720:25 C7 4C AE 17 E9 CC 0A 31
C728:AB 9V 4C 6E 48 89 4B C6 F6
C730:48 4C 73 00 20 79 00 04 98
C738:ET A7 A9 00 05 0D 20 73 EE
C740:00 C9 FF F0 21 C9 D5 9D
C748:1D 38 E9 D5 00 48 20 73 34
C756:00 20 F1 AE 6A B8 09 BD M7 C7
C758:C6 85 55 AD 5C M6 C6 85 56
C760:20 54 00 4C 8D AD 20 79 B6
C768:00 4C 8D AE M5 15 48 A5 5F
C770:14 48 20 F7 B7 A0 00 B1 91
C778:14 85 63 C8 B1 14 85 62 B7
C780:68 85 14 68 85 15 A2 90 05
C788:38 20 49 BC 60 A2 07 BD 8A
C796:A7 02 9D 04 03 CA 10 F7 C3
C798:60 00 00 00 00 00 00 00 00 00 58
C7A0:01 02 04 08 10 20 40 80 34
C7A8:20 8A 2A 20 F7 B7 A5 14 A0
C7B0:8D 9A C7 20 F1 B7 89 99 CD
C7B8:C7 20 FD AE 20 EB B7 A5 A4
C7C0:14 8D 9B C7 15 45 8D 9C E6
C7C8:C7 8E 9D C7 AD 9A C7 18 8F
C7D8:0A 0A 0A 0A 0A 0A 0A 0A 0A 0A
C7D8:6D 99 C7 AA 8E 9E C7 AD 55
C7E0:9B C7 9D 03 C0 00 00 00 00 00
C7E8:38 ED 99 C7 AA AC 99 C7 C2
C7F0:AD 9C C7 F0 41 B9 A0 C7 B8
C7F8:8D 9F C7 BD 00 C0 19 A0 3A
C800:C7 9D 0B C0 8A 18 69 21 F2
C808:AA 9D A4 C7 18 0A 0A 0A 0A 0A
C812:6D 99 C7 A8 E0 84 B0 1B D7
C818:B7 C0 D6 16 BD 00 C0 0C 0C
C820:0D 9F C7 9D 0B C0 8A 18 7B
C828:69 21 AA 98 18 69 08 B8 A3
C830:4C 14 C8 4C 7A C8 AC 99 B4
C838:C7 A9 FF 38 F9 C7 A0 C7 BD 0B
C840:9F C7 HD 0B C0 2D 9F C7 BD
C848:9D 0B C0 8A 18 69 21 AA 7A F7
C850:AD 9A C7 18 0A 0A 0A 0A 0A 0A
C858:99 C7 A8 E0 84 B0 1B B9 A2
C860:87 C0 D6 16 BD 00 C0 0C 0C
C868:9F C7 9D 0B C0 8A 18 69 E9
```

C870:21 AA 98 18 69 08 A8 4C DA
C878:5B CB AE 9E C7 AD 9D C7 A1
C880:9D 0C CG 60 28 8A AD 20 A8
C888:F7 B7 A5 14 8D 9A C7 20 80
C890:F1 B7 BE 99 C7 20 F1 B7 CE
C898:8E 9B C7 20 F1 B7 8E 9C 7B
C8A0:C7 AD 9A C7 18 0A 0A 58
C8A8:0A 0A 6D 9A C7 6D 99 C7 08
C8B0:AA AD 9B C7 6D 1C C0 AD 7F
C8B8:9C C7 9D 14 C0 60 20 8A D1
C8C0:AD 2B F7 B7 A5 14 8D 9A DE
C8C8:C7 2B F1 B7 BE 99 C7 17 AC
C8D0:99 C7 AF FF 3E F9 A9 C7 09
C8D8:8D 9B C7 AC 9A C7 85 9F E2
C8E0:C0 2D 9B C7 99 F9 C0 60 3B
C8E8:2B 8D 9A AD 20 F7 87 A5 14 E2
C8F0:8D 9A C7 20 F1 87 88 99 10
C8F8:T7 AC 99 C7 B9 A0 C7 8D B6
C900:9B C7 AC 9A C7 B9 9F C0 B7
C908:0D 9B C7 99 F9 C0 60 20 7C
C918:8A AD 2B F7 B7 A5 14 AB FC
C918:8B BC 9A C7 20 F1 B7 8E A9
C928:99 C7 AD 9A C7 18 0A 0A 8E
C928:0A 6D 99 C7 A9 A0 00 99 51
C938:87 C0 60 20 8A AD 20 F7 09
C938:87 A4 14 88 8A C9 A7 20 C7 18
C942:F1 B7 BE 99 C7 AD 9A C7 18
C948:18 0A 0A 0A 6D 99 C7 A8 56
C958:AB A1 99 87 C0 60 00 20 4C
C958:8A AD 2B F7 B7 A4 18 2C 85
C960:56 C9 2B F1 B7 8A AC 56 4C
C968:C9 99 A3 C9 60 20 8A AD 0E
C970:20 F7 B7 A5 14 C9 00 F0 1C
C978:03 4C 00 C0 78 A9 31 8D 07
C980:14 03 A9 EA 8D 15 03 A9 33
C988:FF 8D 6D DC A9 8D 8D 1A 73
C990:D6 58 A9 00 00 8D 15 0D 60 9A

Program 3: Sprite Kernel

Please refer to the "MLX" article in this issue before entering the following listing.

C740:00 C6 AA AD 02 C6 9D 1C 34
C748: C0 AD 03 C6 9D 14 C0 AD DC
C750:07 C6 AE 08 C6 AC 09 C6 2D C0
C758:60 8B 07 C6 8E 08 C6 8C 77
C760:09 C6 AC 00 C6 CA 09 FF 38 D0
C768: F9 CA 00 C6 8D 02 C6 AC 01 AE
C776: C6 B9 9F C0 2D 02 C6 99 6A
C778: 9F C0 AD 07 C6 AE 08 C6 F5
C780: AC 09 C6 8D 07 C6 8E 2C
C788:00 C6 BC 09 C6 AC 00 C6 9F
C790: B9 CA 00 C6 8D 02 C6 AC 01 81
C798: C6 B9 9F C0 0D 02 C6 99 11
C7A0: 9F C0 AD 07 C6 AE 08 C6 1E
C7A8: AC 09 C6 60 8D 07 C6 8E 54
C7B0:08 C6 BC 09 C6 AD 01 C6 CD
C7B8: 18 0A 0A 0A 6D 00 C6 A5 8A
C7C0: A9 00 99 87 C6 AD 07 C6 62
C7C8: AB 00 C6 AC 03 C6 6D 8D 07
C7D0:07 C6 BE 08 C6 BC 09 C6 29
C7D8:AD 01 C6 18 0A 0A 0A 6D 03
C7E0:00 C6 AB 09 A1 99 87 C6 10
C7E8:AD 07 C6 AE 08 C6 AC 09 92
C7F0: C6 60 8D 07 C6 BE 08 C6 65
C7F8: BC 09 C6 AC 00 C6 AD 01 2C
C800: C6 99 A3 C9 AD 07 C6 AE A1
C808:00 C6 AC 09 C6 60 00 00 2D

Program 4: Sprite BASIC Demo

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing In Programs" in this issue of COMPUTE!.

```

HC 10 IF Z=2 THEN 40
BB 20 IF Z=0 THEN Z=1:PRINT "[CLR][WHT][DOWN]LOADING
[SPACE]SPRITE 32":LOAD "
SPRITE 32",8,1
JP 30 IF Z=1 THEN Z=2:PRINT "LOADING SPRITE BASIC":LOAD
D"SPRITE BASIC",8,1
SQ 40 SYS 50688:POKE 53281,6
QA 50 FOR T=255*64 TO T+62:POK
E T,255:NEXT
XE 60 FOR L=0 TO 2:RASLT L,(L+
1)*54+50:NEXT
XK 70 SPRITE 1
GS 80 FOR ROW=0 TO 3:FOR S=0 T
O 7
DD 90 PLACE RO,S,30+S*40,60+50
*ROW
AX 100 IF RO>0 THEN:ENABLE RO,
S
CH 110 SET RO,S,255,7+S+RO
MJ 120 NEXT:NEXT:LIST

```

Program 5: ML Demo

Please refer to the "MLX" article in this issue before entering the following listing.

6000:AA:00	00	BD	10	60	9D	CF	3F	05
6008:EE:00	03	FD	5F	4C	4F	60	4A	
6012:00:00	00	00	00	00	00	00	00	00
6018:00:00	00	00	00	00	78	00	01	BB
6020:FE:00	03	FF	00	07	FF	80	5D	
6028:07:FF	3A	FF	FF	CF	FF	FF	8E	
6030:C0:00	0F	FF	CF	07	FF	80	07	61
6038:FF:90	63	FF	00	01	FF	00	7B	
6040:00:00	78	00	00	00	00	00	00	1F
6048:00:00	00	00	00	00	00	00	00	A9
6050:00:BD	BD	21	D0	6D	20	00	AD	
6058:93:20	2D	D2	FF	A5	01	BD	00	B1
6060:C6:20	12	C6	A9	01	BD	01	A4	
6068:C6:09	A1	4D	BD	C4	C6	A0	00	74
6070:A2:32	A9	BD	BD	00	CE	8C	00	
6078:B2:02	C6	BC	03	C6	20	15	CG	55
6080:AF:FF	BD	BD	BC	8C	4E	60	7A	
6088:8A:6D	E4	60	BD	03	C6	20	B2	
6090:18:BD	AD	01	C6	C9	03	BE	00	
6098:03:20	20	24	C6	18	AB	69	23	B4
60A0:AA:90	01	C8	EE	00	CD	AD	3A	

60A8:00 C6 C9 08 D8 C9 18 AD 60
60B0:04 C6 69 32 8D 04 C6 EE 6E
60B8:01 C6 AD 01 C6 C9 04 D0 A7
60C0:AD 4C ED 60 00 01 02 04 5A
60C8:06 00 01 03 04 07 00 00 02 1B
60D0:03 04 06 08 00 00 00 00 05 00
60D8:00 01 01 01 01 01 02 02 1C
60E0:02 02 02 08 00 00 A2 08 29
60E8:BD 44 60 C9 08 F0 18 6D 18
60F0:01 C6 BD C4 60 8D 00 00 E6
60F8:20 21 C8 8E 4C 88 60 4C 8C
6100:E2 61 32 55 78 9B BE 1B 99
6108:02 AD 2D 00 00 00 9B 00 E1 6B
6110:00 2D 00 00 00 78 00 00 E1 C3
6118:0A 00 00 55 00 00 00 00 E1 17
6120:00 2D 00 00 00 00 00 00 00 00 2E
6128:01 01 00 00 00 00 00 00 00 00 AB
6130:01 01 00 00 00 00 00 00 00 00 33
6138:01 00 00 00 00 00 00 00 00 00 7B
6140:00 01 3C 3C 3C 3C 3C 3C 16
6148:3C 3C 00 00 00 6E 00 00 6E 60
6150:00 6E 00 00 00 A8 00 00 00 A8 54
6158:A0 00 00 D2 00 00 00 00 D2 6B
6160:D2 E8 82 80 4F E8 4F 4F 82
6168:80 4F 00 00 00 E8 00 00 88 63
6170:00 02 00 00 E8 00 00 B2 D9

Program 6: ML Demo Boot

For instructions on entering this listing, please refer to "COMPUTER's Guide to Typing In Programs" in this issue of COMPUTER.

```

RS 10 IF Z=3 THEN SYS 24576
ER 20 IF Z=0 THEN Z=1:PRINT "
[CLR]E5$LOADING SPRITE 3
2":LOAD "SPRITE 3",8,1
CJ 30 IF Z=1 THEN Z=2:PRINT "L
LOADING SPRITE KERNAL":LO
AD "SPRITE KERNAL",8,1
GS 40 IF Z=2 THEN Z=3:PRINT "L
LOADING ML DEMO":LOAD "ML
DEMO",8,1

```

MODified Shapes For Atari ST

Robert G. Geiger

This fresh adaptation of a popular COMPUTE! program creates pleasing graphics and also contains valuable information about using GEMSYS and VDISYS in ST BASIC. With the techniques explained here, you can draw on a full-screen graphics area (without BASIC's usual window borders), manipulate dialog boxes, and monitor mouse events.

Paul Carlson's article "MODified Shapes For IBM" (COMPUTE!, May 1986) is interesting both as a tutorial on the MOD operator and for its outstanding graphics. Since ST BASIC also has the MOD operator, the logic used in the IBM program works equally well on the Atari ST. But the ST is capable of doing much more. With the aid of GEMSYS and VDISYS, you can not only replicate the original program, but also add distinctive ST features such as dialog boxes and mouse input.

Type in "MODified Shapes For ST" below and save a copy before you run it. When typing the program, you'll notice that several lines (those containing VDISYS or GEMSYS calls) are more than 80 characters long. This is done so that all the information for each GEM call is on one program line. The ST BASIC editor allows you to enter lines up to 255 characters in length, provided that the first character in the second screen line is a space.

If you have a 520ST with 512K RAM and the TOS operating system on disk instead of in ROM (Read Only Memory), you must turn off buffered graphics before you run the program. If your ST has more than 512K of memory or TOS in ROM, you should have enough memory to run the program without taking this step.

The program runs in any screen resolution—low or medium resolution on a color monitor, or high resolution on a monochrome monitor. However, low resolution is truest to the four-color IBM screen used in the original program. In medium or high resolution, the design occupies only part of the screen.

From PC To ST

If you have any familiarity with IBM BASIC, you may find it instructive to compare the original program with the ST version. Some statements in the PC/PCjr program, such as KEY OFF, are unnecessary in ST BASIC and can be omitted. Most of the program logic, which simply manipulates variables, works on the ST with no modification at all.

However, other operations require different commands. For instance, at the conclusion of the IBM program, the INKEY\$ statement is used to make the program pause until you press a key. ST BASIC lacks INKEY\$, but you can substitute the INP(2) function. And

though the LINEF command in ST BASIC differs a bit in syntax, it can draw lines much like the IBM version. The IBM clears the screen with CLS, but the ST uses CLEARW 2, and so on.

It's possible to translate most of the IBM program by making BASIC substitutions, but if you confine yourself to ordinary BASIC commands, you'll end up with a translation that's almost, but not quite, satisfactory. One major problem involves the ST BASIC output window. When you open the window to full screen size with FULLW 2:CLEARW 2, part of the visible screen area is taken up by the window border, title line, and menu bar. In low resolution, the usable screen area is less than 40 characters wide, and you can print only 17 lines of text before the window's contents begin to scroll upward.

Because screen space is taken up by the window borders, it appears impossible to duplicate the IBM's 320 × 200 pixel screen exactly. Even worse, while IBM BASIC defines the upper-left corner of the screen as coordinate (0,0), ST BASIC considers coordinate (0,0) to be the upper-left point inside the output window. As a result, any graphics designed to occupy the entire IBM screen will be clipped in the ST BASIC output window.

Full Screens In ST BASIC

The solution is to use system calls for screen output. GEM (Graphics

Environment Manager) allows you to draw anywhere on the screen, including the areas normally occupied by the BASIC windows themselves. Two of the more important parts of GEM are the VDI (Virtual Device Interface), which handles low-level mouse input and graphics display, and the AES (Applications Environment Services), which handles more complex routines such as managing windows, drop-down menus, icons, and dialog boxes.

The basic method of calling a VDI routine is to store the information it requires into reserved memory locations which are defined by the reserved variables CONTRL, PTSIN, and INTIN. These memory locations are known as *parameter blocks*. Every VDI routine requires different information, and some VDI routines don't need information in all three parameter blocks. Once this preliminary work is done, you call the VDI routine with the statement VDISYS(0). The 0 is a dummy parameter and can be any numeric value. You can learn more about VDISYS routines in a two-article series entitled "Adding System Power To ST BASIC" in the April and May 1986 issues of COMPUTE!.

The procedure for calling an AES routine is similar—first you store the information it requires in memory, then you call the routine with a GEMSYS statement—but different information must be passed to the routine, and the number inside the parentheses is significant. For instance, GEMSYS(52) calls AES routine 52 (see below). This program uses VDISYS to create graphics, and GEMSYS to handle user input.

Dialog Boxes

Some of the most useful AES functions involve various forms of the *dialog box*—a box that appears on top of the current screen display whenever it's time for you to select an option, respond with a yes or no answer, and so forth. When the interaction is over, GEM restores the screen and lets you continue where you left off. Dialog boxes are a powerful way of creating a friendly atmosphere in your programs. The full capabilities of the dialog box are beyond the scope of BASIC (un-

less you have the *Resource Construction Set* utility from the *ST Development System*), but two forms of the dialog box—the *alert box* and the *error box*—are available.

When you run MODified Shapes, it begins by displaying a dialog box with three options labeled EX1, EX2, and EX3. Depending on which option you click on, the program will create example screen 1, 2, or 3. After you make a choice, the box disappears, the screen is redrawn, and the program proceeds. This dialog box is created with AES routine 52, known as *FORM_ALERT*, which both creates a dialog box and tells GEM to get input from it. To use *FORM_ALERT*, you must store two items of information in memory, then call the routine with GEMSYS(52). After the interaction is finished, *FORM_ALERT* passes one item of information back to you.

Most of the information needed by *FORM_ALERT* can be passed in the form of a BASIC string. First the string is defined, then you POKE the address of the beginning of the string in a reserved variable area known as *ADDRIN* (ADDress IN). This tells GEM where the string is located.

The *FORM_ALERT* string begins with a code number indicating which sort of icon you want the box to contain. You may choose a stop sign icon, an exclamation point, or a question mark. These icons appear frequently during GEM desktop operations and are familiar to every ST user. After the icon number comes the text which you want to print inside the box. If an icon is also used, the box has enough room for up to five lines of text.

Buttons In A Box

The next portion of the string contains the text you want to appear inside the *buttons*. Don't confuse this sort of button with the physical button on the ST mouse device. In this context, a button is a smaller boxed-in area within the dialog box. You point to the dialog button with the mouse, then click the left mouse button to select that option.

Up to three dialog buttons may be included in a single dialog box. If you include only one button, its box may contain up to 20 characters of

text. It is also possible to outline one of the buttons with a heavier line to indicate that it can be selected by pressing RETURN as well as clicking with the mouse.

Line 70 of the program creates a typical *FORM_ALERT* string. Notice that each component of the string is enclosed in a set of square brackets in the sequence [icon code] [message text] [button text]. Notice that new lines within the message text and button text are separated by the logical OR character (|). This character is obtained by pressing the backslash key (\) while holding down SHIFT.

After creating a string and POKEing its location into memory, you must POKE a value into the location defined as *GINTIN* to indicate which button is to be chosen by pressing RETURN. POKE a zero into this location to indicate that RETURN should be ignored. POKE *GINTIN* with a 1, 2, or 3 to indicate the first, second, or third button, respectively.

When the *FORM_ALERT* dialog is over, you need some way to learn what choice was made. This output is returned in the location defined as *GINTOUT*, which you can PEEK from BASIC. When *GINTOUT* equals 1, the first dialog button was clicked. Values of 2 and 3 indicate that the second and third dialog buttons were clicked. Again, keep in mind that these are buttons within the dialog box on the screen, not physical buttons on the mouse.

Reading Mouse Events

MODified Shapes uses another AES routine—number 21, known as *MOUSE_EVENT*—to pause until you press both mouse buttons. The *MOUSE_EVENT* routine requires three inputs which are passed in locations beginning at *GINTIN*. The first value to be passed indicates the number of clicks to be detected, the second value indicates the mouse button to be read, and the third indicates the button condition you wish to look for. The number of clicks should be either 1 or 2. For the second value, use the value 1 to indicate the left button, 2 to indicate the right button, and 3 to indicate both buttons. The third value determines which condition—being pressed or not



"MODified Shapes For Atari ST" demonstrates how to draw graphics on the entire screen surface, including areas normally occupied by BASIC's window borders.



With the aid of GEMSYS, you can call system routines from BASIC to create dialog boxes like the one shown here.

pressed—the routine checks for. In most cases this value will be 1, indicating that you want to know when the indicated button is pressed. If you supply a 0, the routine tells you whether the button is not pressed.

By calling GEM and AES routines, we can not only mimic the IBM's graphics, but also add the ST's own signature to the program in the form of dialog boxes and mouse input. The accompanying table shows summaries of the various VDI and AES routines used in this program, along with the program lines in which each routine is called.

MODified Shapes For ST

```

10    A#=GB:CONTROL=PEEK(A#):GL
20    OBAL=PEEX(A#+4):GINTOUT=PEE
30    K(A#+8):GINTOUT=PEEX(A#+12
40    ):ADDRIN=PEEK(A#+16)
50    POKE CONTRL,14:POKE CONTR
60    L+2,0:POKE CONTRL+6,4:POKE
70    INTIN,0:POKE INTIN+2,0:POKE
80    INTIN+4,0:POKE INTIN+6,
90    0:VDISYS(0)
100   POKE CONTRL,14:POKE CONTR
110   L+2,0:POKE CONTRL+6,4:POKE
120   INTIN,1:POKE INTIN+2,1000
130   :POKE INTIN+4,1000:POKE IN
140   TIN+6,1000:VDISYS(0)
150   M#=ADDRIN:POKE GINTIN,0:'FORM_ALERT
160   MENUS="1111:MODified Shapes for ST":EX 1:EX 2:EX 3
170   EXITBOX: POKE CONTRL,122:
180   POKE CONTRL+2,0:POKE CONTRL+6,0:VDISY
190   S(0)
200   FOR J=0 to 3:II=-1:JJ=1:
210   FOR I=0 to 6:JJ=-JJ:IF I<J
220   or I>6-J THEN 280
230   IF J<2 or I>2 THEN C=C M
240   OD 3+1
250   IF J<3 THEN C=C MOD 3+1
260   X(1)=:X(2)=39:X(3)=78:Y
270   (1)=0:Y(3)=0:IF II=JJ THEN
280   Y(2)=48 ELSE Y(2)=48
290   FOR N=1 to 11:XI=3+X(3)+I
300   *39:YI=175-Y(3)-J*48+11*JJ
310   *24
320   FOR M=1 to 3:X2=3-X(M)+*39:Y2=175-Y(M)-J*48+11*JJ
330   *24:C=C MOD 3+1
340   COLOR 1,1,C:POKE CONTRL,6
350   :POKE CONTRL+2,2:POKE CONTR
360   L+6,1:POKE PTSIN,X1:POKE PTSIN+2,Y1:POKE PTSIN+4,X2
370   :POKE PTSIN+6,Y2:VDISYS(0)
380   X1=X2:Y1=Y2:NJ=M MOD 3+1

```

Set_Color Representation (lines 20, 30, 570, 580)

Input Parameters

POKE CONTRL,14 opcode
 POKE CONTRL+2,0 number of vertices
 POKE CONTRL+6,4 number of attributes
 POKE INTIN,0-15 number of pen
 color
 POKE INTIN+2,0-1000 red intensity
 POKE INTIN+4,0-1000 green intensity
 POKE INTIN+6,0-1000 blue intensity

Clear_Workstation (lines 40, 170, 310, 440)

Input Parameters

POKE CONTRL,3 opcode
 POKE CONTRL+2,0 number of vertices
 POKE CONTRL+6,0 number of attributes

Show_Cursor (lines 50 and 110)

Input Parameters

POKE CONTRL,122 opcode
 POKE CONTRL+2,0 number of vertices
 POKE CONTRL+6,1 number of attributes
 POKE INTIN,0 reset flag

(NOTE: The VDI normally makes note internally of how often the HIDE_CURSOR call is used; to disable this function, set the reset flag to 0.)

Form_Alert

(Lines 60-80,120-140)

Input Parameters

POKE GINTIN,0 button simulated by
 pressing RETURN
 X#=ADDRIN ADDRIN is addressed
 as a double-precision
 variable
 POKE X#,VARPTR(Message\$)

Output Parameters

KEY=PEEK(GINTOUT) value of the
 button clicked

Hide_Cursor (line 90)

Input Parameters

POKE CONTRL,123 opcode
 POKE CONTRL+2,0 number of vertices
 POKE CONTRL+6,0 number of attributes

Polyline (lines 240, 380, 510)

Input Parameters

POKE CONTRL,6 opcode
 POKE CONTRL+2,2 number of vertices
 one line
 POKE CONTRL+6,0 number of attributes
 POKE PTSIN,X1 X coordinate of first
 point
 POKE PTSIN+2,Y1 Y coordinate of first
 point
 POKE PTSIN+4,X2 X coordinate of
 second point
 POKE PTSIN+6,Y2 Y coordinate of
 second point

Event_Button (lines 290, 420, 560)

Input Parameters

POKE GINTIN,1-2 number of clicks
 for action
 POKE GINTIN+2,1-3 mouse button(s) to
 be read
 POKE GINTIN+4,1 button condition
 to detect

```

260  XD(M)=RU*X(M)+SU*X(NJ):YD
(M)=RU*Y(M)+SU*Y(NJ):NEXT
M
270  FOR P=1 to 3:X(P)=XD(P):Y
(P)=YD(P):NEXT P,N
280  NEXT I,J
290  POKE GINTIN,1:POKE GINTIN
+2,1:POKE GINTIN+4,1:GEMSY
S(21):GOTO EXITBOX
300  EX2: SU=.12:RU=1-SU
310  POKE CONTRL,3:POKE CONTRL
+2,0:POKE CONTRL+6,0:VDISY
S(0)
320  FOR I=0 to 3:FOR J=0 to 3
:IF I MOD 2=J MOO 2 THEN 3
40
330  Y(1)=49:Y(2)=0:Y(3)=0:Y(4)
=49:GOTO 350
340  Y(1)=0:Y(2)=49:Y(3)=49:Y(
4)=0
350  X(1)=20:X(2)=20:X(3)=89:X
(4)=89
360  FOR N=0 to 18:X1=X(4)+I*6
9:Y1=Y(4)+J*49
370  FOR M=1 to 4:X2=X(M)+I*69
:Y2=Y(M)+J*49
380  COLOR 1,0,M MOD 2+1:POKE
CONTRL,6:POKE CONTRL+2,2:P
OKE CONTRL+6,0:POKE PTSIN,
X1:POKE PTSIN+2,Y1:POKE PT
SIN+4,X2:POKE PTSIN+6,Y2:V
DISYS(0)
390  X1=X2:Y1=Y2:NJ=M MOD 4+1
400  XD(M)=RU*X(M)+SU*X(NJ):YD
(M)=RU*Y(M)+SU*Y(NJ):NEXT
M
410  FOR P=1 to 8:X(P)=XD(P):Y
(P)=YD(P):NEXT P,N,J,I
420  POKE GINTIN,1:POKE GINTIN
+2,1:POKE GINTIN+4,1:GEMSY
S(21):GOTO EXITBOX
430  EX3: SU=.2:RU=1-SU
440  POKE CONTRL,3:POKE CONTRL
+2,0:POKE CONTRL+6,0:VDISY
S(0)
450  FOR J=0 to 2:FOR I=0 to 2
:IF J=0 AND I<1 THEN 550
460  IF I=1 THEN E=31 ELSE E=0
470  X(1)=0:X(2)=25:X(3)=75:X
(4)=100:X(5)=75:X(6)=25
480  Y(1)=31:Y(2)=0:Y(3)=0:Y(4)
=31:Y(5)=62:Y(6)=62
490  FOR N=0 to 10:20:X1=35*X(6)+1
:X75:Y1=223*Y(6)-1
500  FOR M=1 to 6:X2=35*X(M)+1
:X75:Y2=223*Y(M)-1
510  COLOR 1,0,M MOD 3+1:POKE
CONTRL,6:POKE CONTRL+2,2:P
OKE CONTRL+6,0:POKE PTSIN,
X1:POKE PTSIN+2,Y1:POKE PT
SIN+4,X2:POKE PTSIN+6,Y2:V
DISYS(0)
520  X1=X2:Y1=Y2:NJ=M MOD 6+1
530  XD(M)=RU*X(M)+SU*X(NJ):YD
(M)=RU*Y(M)+SU*Y(NJ):NEXT
M
540  FOR P=1 to 6:X(P)=XD(P):Y
(P)=YD(P):NEXT P,N
550  NEXT I,J
560  POKE GINTIN,1:POKE GINTIN
+2,1:POKE GINTIN+4,1:GEMSY
S(21):GOTO EXITBOX
570  BYE: POKE CONTRL,14:POKE
CONTRL+2,0:POKE CONTRL+6,4
:POKE INTIN,0:POKE INTIN+2
,1000:POKE INTIN+4,1000:PO
KE INTIN+6,1000:VDISYS(0)
580  POKE CONTRL,14:POKE CONTRL
+2,0:POKE CONTRL+6,4:POKE
INTIN,1:POKE INTIN+2,0:PO
KE INTIN+4,0:POKE INTIN+6
:VDISYS(0):END

```

Batch Files With IBM BASIC

Lawrence H. Bannister

Anything that a PC-DOS batch file can do, a BASIC program can do better. By calling DOS from BASIC, you can perform many functions that cannot be done with the limited language of batch commands. The demo program below works on any IBM PC with BASICA and DOS 2.1 or later.

Most IBM users already know that you can save a lot of time by using the batch commands of PC-DOS to perform a sequence of DOS commands automatically. But the austere language of DOS provides only three variations of one simple IF statement and has no practical way at all of manipulating strings or performing arithmetic. It's very difficult to write a batch file that creates neat screen displays, makes logical branches, allows user input, and traps errors.

A more flexible technique is to call DOS commands or even batch files from within a BASIC program. This frees you from the limitations of batch files and takes advantage of the string and arithmetic functions of BASIC.

You can call DOS from BASIC as often as you wish by using the SHELL command found in IBM BASICA. Although it is not documented, this command is implemented in version 2.1 or higher of PC-DOS. Aside from a few small problems to be avoided, its possibilities are limited only by your imagination.

(Note: SHELL is also found in

PCjr Cartridge BASIC, but does not seem to work reliably due to memory conflicts. Therefore, these techniques aren't recommended for use on the PCjr.)

The SHELL Game

To demonstrate some of these possibilities, Program 1 below is a BASIC program that displays two menus of options, interprets the user's responses, and then calls a variety of DOS routines in several different ways. Program 2 is a short batch file that is required as part of this demonstration.

When you run the BASIC program, it shows a menu offering four choices:

MENU A:

1. Show system date
2. Show system time
3. Show system date and time
4. None of the above

Enter your choice:

When the user presses a key, the program checks to see if the keypress was 1, 2, 3, or 4, and if so, uses the SHELL command to call the appropriate DOS function: DATE, TIME, or a batch file (Program 2) that calls both DATE and TIME.

When DOS returns control to BASIC, Program 1 displays a second menu:

MENU B:

1. Run Checkdisk
2. Show Disk Directory
3. None of the above

Enter your choice:

This is similar to the first menu, except this time the program

calls a DOS function that requires a parameter to be passed to the DOS command line. The BASIC program asks the user for the necessary information, then concatenates the appropriate command-line string.

Notice that the SHELL command can pass either a literal string, as done in the first menu, or a string variable, as in the response to the second menu.

No Recursion Allowed

There are two considerations to keep in mind when using this technique. First, make sure your system has enough memory. Although DOS, BASIC A, and your BASIC program can be loaded into a machine with as little as 64K of Random Access Memory (RAM), you won't have much memory left over to do anything very useful. At least 92K RAM is desirable, because DOS and BASIC A together use about 90K if that much is available. You need still more memory if you also want to run a batch file that calls a lengthy program like EDLIN.

Second, be sure not to create a sequence that is *reentrant* or *recursive*. For example, the result will be unpredictable if your BASIC program calls a batch file that, in turn, calls BASIC. Reentrant sequences of this nature are apt to cause a system crash that can be remedied only by turning off the power.

A minor aggravation is that DOS scrolls 25 lines on the screen while BASIC scrolls only 24 lines due to the function key display on the 25th line. Furthermore, BASIC and DOS each maintain an independent pointer to the screen position of the cursor. These differences can cause BASIC PRINT statements to overwrite something that DOS has just printed.

To avoid this problem, always start the BASIC program with the KEY OFF command to turn off BASIC's function key display. Then use a CLS (clear screen) command each time that DOS returns control to BASIC, or, as shown in the sequence following the second menu in Program 1, surround the SHELL commands with LOCATE 24,1 statements and two blank PRINT lines to ensure that both DOS and BASIC always start scrolling from the bottom of their own screens.

Program 1: BASIC Batch Demo

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing In Programs" in this issue of COMPUTE!.

```

MD 1000 'PROCEDURE DESCRIPTION
DD 1010 '  clear screen and display a menu offering four choices
DD 1020 '  wait for user response
EE 1030 '  if user response is not valid
AE 1040 '    then : display error message and repeat the menu
KI 1050 '  else :
DF 1060 '    invoke the selected DOS function or Batch file
EE
NL 1070 '  clear screen and display a second menu
PA 1080 '  wait for user response
EE
FO 1090 '  if user response is not valid
OK 1100 '    then : display error message and repeat the menu
JG 1110 '  else :
AH 1120 '    invoke the selected DOS function or program
HE 1130 '  if
JG 1140 '    then
EN 1150 KEY OFF : CLS
KP 1160 GOTO 1210
IC 1170 '
PA 1180 PRINT
    'error message
EE 1190 PRINT "#* * * * * ILLLEGAL RESPONSE ^ REDO"
HP 1200 '
SM 1210 PRINT : PRINT "MENU A :"
    'display menu
DF 1220 PRINT : PRINT "
    1. Show system date"
FN 1230 PRINT : PRINT "
    2. Show system time"
PR 1240 PRINT : PRINT "
    3. Show system date and time"
FK 1250 PRINT : PRINT "
    4. None of the above"
NC 1260 PRINT :PRINT: INPUT "Enter your choice : ", A$
IE 1270 '
EN 1280 IF A$ = ""      THEN 118
    'check response
OF 1290 IF ASC(A$) < 49 THEN 118
    '
HF 1300 IF ASC(A$) > 52 THEN 118
    '
HE 1310 '
CE 1320 IF A$ = "1" THEN SHELL "
    DATE"
    'if valid :
FB 1330 IF A$ = "2" THEN SHELL "
    TIME"
FA 1340 IF A$ = "3" THEN SHELL "
    PROG2"
IA 1350 '
FN 1360 CLS
    'clear screen
MD 1370 GOTO 1410
JJ 1380 '
DM 1390 PRINT "#* * * * * ILLLEGAL RESPONSE ^ REDO"
    'error message
HO 1400 '
DE 1410 PRINT : PRINT "MENU B :"
    'display menu
IM 1420 PRINT : PRINT "

```

1. Run Checkdisk

```

NN 1430 PRINT : PRINT "
2. Show Disk Directory"
DN 1440 PRINT : PRINT "
3. None of the above"
NN 1450 PRINT:PRINT : INPUT "Ent
er your choice : ", A$
AH 1460 PRINT
JI 1470 '
JB 1480 IF A$ = "" THEN 139
      0
      'check response
ED 1490 IF ASC(A$) < 49 THEN 139
      0
NK 1500 IF ASC(A$) > 51 THEN 139
      0
II 1510 '
FA 1520 IF A$ = "3" THEN 1630
      'if valid :
LL 1530 IF A$ = "1" THEN B$ = "C
HK0SK"
OC 1540 IF A$ = "2" THEN B$ = "0
IR"
KA 1550 INPUT "Enter drive letter
      : ", C$
NC 1560 IF C$ = "" THEN 1550
NP 1565 X=ASC(C$+CHR$(0)):IF X<6
      5 OR X>66 THEN 1550
JF 1570 D$ = B$ + LEFT$(C$,1) +
      ":""
NK 1580 LOCATE 24,1
IC 1590 IF A$ = "1" THEN GOSUB 1
      710
KH 1600 SHELL 0$
JI 1610 PRINT : PRINT
IN 1620 '
ID 1630 PRINT "End of BASICa pro
gram, returning to SYSTE
M"
AF 1640 PRINT
DN 1650 PRINT TAB(20) "Normally
would return to SYSTEM h
ere."
DO 1660 PRINT TAB(20) "but for d
ebug and demo purposes t
he"
HO 1670 PRINT TAB(20) "program w
ill restart after a dela
y"
HN 1680 FOR I = 1 TO 5000 : NEXT
      I : RUN
JC 1690 '
IJ 1700 '
NO 1710 PRINT
      'sub
      to show warning
IF 1720 PRINT "WARNING : You wil
      1 get error message 'Bad
      command ...'"
CA 1730 PRINT "                   if the
      called program is not on
      -"
JL 1740 PRINT "               the dis
      k in the default drive"
KI 1750 RETURN

```

Program 2: Batch File For Demo

Note: This batch program must be entered with a text editor such as EDLIN or a word processor that can save files in ASCII format.

```
ECHO OFF
ECHO .
REM Display the system date
DATE
ECHO .
REM Display the system time
TIME
:ENDPROG2
```

Guardian Angel

For Apple DOS 3.3

Boris Troyanovsky

This program lets you protect Apple DOS 3.3 disks against unauthorized use or copying. Once a disk is protected, it cannot be copied with ordinary copy programs—including advanced nibble copiers, unless the would-be copier knows the proper parameters. It works on all Apple II-series computers with DOS 3.3 and a disk drive. If you're using ProDOS and want similar protection, see "Apple ProDOS Protector" elsewhere in this issue.

Would you like the ability to protect your personal disks against unauthorized copying? No matter where you stand on the copy protection controversy, nearly every computer user has disks that he or she doesn't want others to duplicate. "Guardian Angel" lets you protect any DOS 3.3 disk against unauthorized copying, yet allows you access to the disk with a simple, four-digit code.

To use Guardian Angel, you must enter and save five programs. The first four are very short machine language files which can be entered directly from the Apple II's built-in machine language monitor. To enter the monitor, type CALL -151 and press RETURN. Then type in the lines shown here:

```
0300: A9 B3 A8 18 28 D9 B3 60
0310: B1 60 B1 00 B1 09 30 B3
031B: B8 20 B8 00 B1 F0 FE 60
0330: B0 B1 EF DB
1B5B: 20 00 03 EE 19 03 CE 15
1B60: B3 F0 03 4C 5B 1B 20 00
1B6B: B3 60
B7BD: B8 B6 2B 4C DF BC AD E5
BCDF: C9 B5 00 CB A9 D9 A2
BCE7: DA 4C EE BC A9 D5 AA BD
BCEF: 53 B8 BD E7 BB BE 7A BC
BCFF: B8 B5 B9 84 2A 9B 4C A4
BCFF: B9
```

When you finish entering these lines, press CONTROL-RESET to exit the monitor and return

to BASIC.

Now you must BSAVE each file to disk. Because these files are loaded under program control, you must save them using the exact filenames shown here. Enter these lines in direct mode (without line numbers) to BSAVE the four machine language files:

```
BSAVE IOB,AS300,LS33
BSAVE HTR.OBJ,A$BCDF,LS21
BSAVE HPREM.OBJ,ASB7BD,LS0C
BSAVE COPY.OBJ,A$1B5B,LS6E
```

Next, type in and save the Guardian Angel program following this article. This program is in Applesoft BASIC and may be saved under any filename.

Protecting Disks

To protect a disk, load and run Guardian Angel. It automatically loads the four machine language files into memory, then displays a menu on the screen. Press C to select the copy protection option.

The program then asks you to enter a unique, four-digit combination lock for that disk. Each digit can be a number from 0-9; press the ESC key if you make a mistake. Be sure to write down the combination and store it in a safe place. If you forget the combination, you may not be able to gain access to the protected disk yourself.

After you have entered the combination, the program prompts you to put the disk you want to protect into drive 1. To be on the safe side, you may want to write-protect this disk by covering its notch with tape. Insert the disk and press RETURN. The program considers this disk the *original*, which serves as a model for the new, copy-protected *destination* disk.

Next, you are prompted when it is time to insert the destination

disk. Since the destination disk will be completely erased prior to being copied, be sure that it doesn't contain any valuable information. The program will continue to give you instructions as it completes the protection process. Simply follow the onscreen prompts until you see the message DONE.

At this point the original disk is unchanged, and the destination disk contains a copy-protected version of the original. The new disk will boot normally and behave normally, except that it is protected from unauthorized access and copying.

Restricted Access

Although Guardian Angel protects the disk, you are responsible for seeing that nobody using the disk has an opportunity to examine its contents. If you intend to let others use the disk, no program should give control of the system back to the user. That is, the program must not let the user exit to Applesoft BASIC or the machine language monitor. To prevent exit to BASIC, add the following lines to any Applesoft program:

```
0 ONERR GOTO 63999: POKE 1011,0
63999 RESUME
```

These lines protect an Applesoft program from being interrupted by CTRL-C or RESET.

To protect a machine language program the same way, include these two commands at the beginning of the program:

```
LDA #$00
STA $03F3
```

If you take these precautions, the disk cannot be copied and the programs on it can't be LISTed by anyone except you. However, since the disk will boot normally, other people can still use the programs it contains.

Denying All Access

In some cases you may want to prevent others from using anything on a protected disk. To accomplish this, save the following program on your original disk using the filename HELLO. When typing this program, replace XXXX with the four-digit combination you intend to use for that disk, and replace MYPROG with the filename of the program you wish to run.

```
0 ONERR GOTO 63999:POKE 1011,0
10 INPUT AS
20 IF AS <> "XXXX" THEN PRINT
30 PRINT "WRONG ACCESS CODE"; PR#6
40 PRINT "CORRECT ACCESS CODE"
63999 RESUME
```

After saving the special HELLO program, copy-protect the disk as described above. When you boot the protected disk, it immediately prints a question mark, which is the signal to enter the secret combination. No one can proceed any further until the right combination is entered.

Reopening The Lock

There may be times when you need to access a disk after protecting it. To do this, run Guardian Angel and choose the A option from the main menu, then enter the combination for that disk when prompted. If the combination is correct, Guardian Angel returns you to Applesoft BASIC. Now you can use all the DOS commands (CATALOG, SAVE, LOAD, etc.) which were previously denied.

If you respond with the wrong combination, the computer will report an I/O ERROR every time you try to access the disk.

Guardian Angel

For instructions on entering this listing, please refer to "COMPUTER's Guide to Typing in Programs" in this issue of COMPUTER.

```
67 10 HIMEM: 6999:0$ = CHR$(4)
68 20 PRINT 0$;"BLOAD 10B"
69 30 PRINT 0$;"BLOAD HTR.OBJ"
70 40 PRINT 0$;"BLOAD HPREM.OBJ"
71 50 PRINT 0$;"BLOAD COPY.OBJ"
72 60 TEXT : HOME : HTAB 14: PRI
NT "GUARDIAN ANGEL"
73 70 HTAB 7: PRINT "DISK COPY P
ROTECTION SYSTEM": NORMAL
74 80 VTAB B: HTAB 5: PRINT "00
YOU WISH TO": PRINT : HTA
B 5: PRINT "A"CESS A COPY
-PROTECTED DISK": HTAB 10:
PRINT "OR": HTAB 5: PRINT
"COPY-PROTECT A DISK"
IC 90 VTAB B: HTAB 20: GET A$
IC 100 IF A$ = "A" THEN GOTO 130
```

```
## 110 IF A$ = "C" THEN GOTO 290
31 120 GOTO 90
34 130 TEXT : HOME : INVERSE : H
TAB 10: PRINT "ACCESS PRO
TECTED DISK": VTAB 23: HT
AB 3: NORMAL PRINT "ES
CJ TO GO BACK TO THE MAIN
MENU"
34 140 VTAB 10: HTAB 12: PRINT "
COMBINATION LOCKS": PRINT
: PRINT "#1" "#2
28 150 PRINT " ( ) ( ) ( )"
36 160 FOR NL = 1 TO 4: VTAB 13:
HTAB B * NL - 1: GET A$
37 170 IF A$ = CHR$(27) THEN RU
N
32 180 IF VAL (A$) > 9 THEN NL =
NL - 1: NEXT NL
30 190 IF VAL (A$) = 0 AND A$ <
> "0" THEN NL = NL - 1: N
EXT NL
37 200 CL (NL) = VAL (A$): PRINT
CL (NL): NEXT NL
38 210 V1 = CL (1) * 10 + CL (2): V
2 = CL (3) * 10 + CL (4)
39 220 IF V1 = 31 THEN V1 = 121
40 230 IF V1 = 63 OR V1 = 64 THE
N V1 = V1 + 50
41 240 IF V2 = 31 THEN V2 = 121
42 250 IF V2 = 63 OR V2 = 64 THE
N V2 = V2 + 50
57 260 POKE 47520,76: POKE 47521
,141: POKE 47522,183
85 270 POKE 4B357,1 + 129: POKE
4B359, V2 + 129
48 280 VTAB 21: PRINT "----DONE--"
-": GET B$: HOME : END
65 290 HOME : INVERSE : HTAB 12:
PRINT "COPY PROTECT DISK
": VTAB 23: HTAB 3: NORMA
L: PRINT "ESCI TO GO BA
CK TO THE MAIN MENU"
26 300 VTAB 10: HTAB 12: PRINT "
COMBINATION LOCKS": PRINT
: PRINT "#1" "#2
22 310 PRINT " ( ) ( ) ( )"
64 320 FOR NL = 1 TO 4: VTAB 13:
HTAB B * NL - 1: GET A$
31 330 IF A$ = CHR$(27) THEN RU
N
40 340 IF VAL (A$) > 9 THEN NL =
NL - 1: NEXT NL
47 350 IF VAL (A$) = 0 AND A$ <
> "0" THEN NL = NL - 1: N
EXT NL
24 360 CL (NL) = VAL (A$): PRINT
CL (NL): NEXT NL
30 370 POKE 34,19
93 380 VTAB 20: PRINT " INSERT
SOURCE DISK INTO DRIVE 1
": HTAB 4: PRINT "PRESS [
RETURN] TO BEGIN PROCESS"
56 390 VTAB 24: HTAB 20: GET A$
55 400 IF A$ = CHR$(27) THEN RU
N
37 410 IF A$ < > CHR$(13) THEN
GOTO 390
55 420 POKE 47520,134: POKE 4752
,43: POKE 47522,133: POK
E 47187,213: POKE 47335,2
131: POKE 4B250,213: POKE
47445,213: SS = 9: SE = 9:0
P = 1: BU = B192: TR = 1: 0
OSUB 710
95 430 A$ = "": FOR A$ = 117 TO 1
54:A$ = A$ + CHR$( PEEK
(8192 + A)): NEXT A
55 440 POKE 47520,76: POKE 47521
,141: POKE 47522,183
91 450 V1 = CL (1) * 10 + CL (2): V
2 = CL (3) * 10 + CL (4)
84 460 IF V1 = 31 THEN V1 = 121
85 470 IF V1 = 63 OR V1 = 64 THE
N V1 = V1 + 50
79 480 IF V2 = 31 THEN V2 = 121
80 490 IF V2 = 63 OR V2 = 64 THE
N V2 = V2 + 50
74 500 POKE 4B357, V1 + 129: POKE
4B359, V2 + 129
22 510 HOME : VTAB 24: HTAB 2: P
RINT "INSERT DESTINATION
DISK INTO DRIVE 1": HTAB
12: PRINT "AND PRESS A KE
Y": HTAB 20: GET B$
69 520 HOME : HTAB 5: FLASH : PR
INT "INITIALIZING": NORM
AL : PRINT "DESTINATION
DISK"
46 530 PRINT : PRINT CHR$(4): "I
NIT "A$": "01"
60 540 HOME : HTAB 4: PRINT "INS
ERT ORIGINAL DISK INTO DR
IVE 1": HTAB 12: PRINT "A
ND PRESS A KEY": HTAB 20:
GET B$
48 550 TC = 0: BF = B192: FOR TK
= 3 TO 34: TC = TC + 1: VT
AB 6: HTAB 16: PRINT "TRA
CK": "1TK": HOME : HTAB 7:
PRINT "READING FROM DRIBI
NAL DISK": BF = BF + 4096
48 560 POKE 796,1: POKE 78B,TK:
POKE 789,15: POKE 792,0:
POKE 793, INT (BF / 256)
85 570 POKE 47520,134: POKE 4752
1,43: POKE 47522,133: POK
E 47187,213: POKE 47335,2
131: POKE 4B250,213: POKE
47445,213
A1 580 CALL 7000
93 590 IF TK = 7 OR TK = 12 OR T
K = 17 OR TK = 22 OR TK =
27 OR TK = 32 THEN GOTO
610
34 600 NEXT TK
70 610 HOME : HTAB 2: PRINT "INS
ERT DESTINATION DISK INTO
DRIVE 1": HTAB 12: PRINT
"AND PRESS A KEY": HTAB
20: GET A$
#6 620 IF TK = 35 THEN TK = 34
C6 630 BF = B192: FOR TA = TK -
TC + 1 TO TK: VTAB 6: HTA
B 16: PRINT "TRACK": "TA:
": HOME : HTAB 7: PRINT
"WRITING TO DESTINATION
DISK": BF = BF + 4096
C2 640 POKE 796,2: POKE 78B,TA:
POKE 789,15: POKE 792,0:
POKE 793, INT (BF / 256)
78 650 POKE 47520,76: POKE 47521
,141: POKE 47522,183: POK
E 4B357, V1 + 129: POKE 4B
359, V2 + 129
9E 660 CALL 7000
38 670 NEXT TA
#1 680 IF TA = 35 THEN HOME : PR
INT "----DONE----": GET B$:
RUN
2A 690 HOME : HTAB 3: PRINT "INS
ERT ORIGINAL DISK INTO DR
IVE 1": HTAB 12: PRINT "A
ND PRESS A KEY": HTAB 20:
GET B$: BF = B192: TC = 0:
NEXT TK
BF 700 END
5E 710 REM ***DISK ACCESS***
87 720 FOR SA = SS TO SE
94 730 POKE 78B,TR: POKE 789,SA:
POKE 796,0P
C9 740 HB = INT (BU / 256): LB =
BU - (HB * 256)
78 750 POKE 792,LB: POKE 793,HB
29 760 CALL 76B: BU = BU + 256: N
EXT SH
25 770 RETURN
```

Directory Plus For Commodore

Thomas C. Carlson

This utility program prints a comprehensive disk directory on the screen or a printer, giving you extra information about the files on your disks. The program requires a 1541 or 1571 disk drive and runs on the Commodore 64, 128, Plus/4, 16, and VIC-20 (with at least 8K expansion). A printer is optional.

Virtually every Commodore disk drive owner knows how to get a listing of a disk directory. The statement LOAD "\$0",8 loads the directory into memory, and L1ST displays it on the screen. To print the directory on a printer, type OPEN 4,4 before you load the directory, and PRINT#4:CLOSE 4 after the listing is complete. The normal directory listing—which includes the filename of each file, its file type, and number of blocks—is fine for everyday use, but inadequate for more advanced purposes. In many programming situations it is necessary to know the load address of a file or the actual track and sector where it begins. When many files are involved, discovering such information can be a tedious process.

"Directory Plus" solves this by automatically printing an expanded disk directory on the screen or printer. In addition to the usual information, the expanded directory includes the disk track and sector where the file begins, and the load address of the file (the address where the file usually loads into the computer's memory). The accompanying figure illustrates a Directory Plus printout for a typical COMPUTE! DISK.

Directory Plus Printout

FILENNAME	TYPE	TR	GC	BLK	START	END
MENU	PRO	17	0	1	012	
128 BOOKS	PRO	17	1	26	2049	
128.ROOT	PRO	9	3	6	2049	
64 BOOKS	PRO	19	6	32	2049	
64 CONTENTS	SEQ	14	6	5		
ALL ABOUT THE 64	PRO	21	2	93	2049	
AUTOBOOTER	PRO	14	4	12	2049	
COMPUTE!	PRO	16	0	2	2049	
COMPUTECOLOR	PRO	16	1	4	55296	
COMPUTSCREEN	PRO	16	3	4	1024	
CUBE1	PRO	6	6	1	2049	
CUBE	PRO	29	5	1	2049	
FLEET LIST.ROOT	PRO	36	10	1	2049	
FLEET LIST	PRO	13	0	4	49152	
GAZETTE	PRO	16	5	19	2049	
HEX WR/128	PRO	8	35	16385		
HEX WR/64.ROOT	PRO	29	4	1	16385	
HEX WR/64	PRO	26	6	37	16385	
HICKORY DICKORY	PRO	13	1	28	2049	
LO	PRO	12	1	7	49152	
LOOK GLASS.ROOT	PRO	36	9	1	2049	
LOOK INDOOR&DEMO	PRO	12	9	12	2049	
MANDLBROT 1	PRO	29	5	12	2049	
MANDLBROT 2	PRO	7	9	2	2049	
MANDLBROT 3	PRO	29	6	3	2049	
MANDLBROT 4	PRO	29	2	2	2049	
MANDLBROT.ROOT	PRO	39	11	4	2049	
MIAMI ICE/128	PRO	18	0	47	7169	
MIAMI ICE/64	PRO	11	2	12	2049	
ML DIVISION.ROOT	PRO	36	16	4	2049	
ML DIVISION	PRO	29	15	2	2049	
MLX	PRO	28	7	17	2049	
MN	PRO	15	9	9	2049	
NT	PRO	14	1	3	2049	
PRODFREADER	PRO	15	1	6	7169	
RIM REPORT	PRO	6	1	3	2049	
SCR HANDLER DEMO	PRO	29	1	3	2049	
SCR HANDLER.ROOT	PRO	29	15	1	2049	
SCREEN HANDLER	PRO	29	3	4	49152	
SEQ FILE CONVERT	PRO	6	6	3	2049	
SOURCE!	PRO	6	7	1	2049	
SOURCE	PRO	29	9	1	2049	
UPSTART	PRO	6	12	4	2049	

Directory Plus works without modification on the Commodore 64, 128 (40- or 80-column screens), Plus/4, 16, and VIC-20 (with at least 8K expansion). Since the VIC-20 screen has only 22 columns, its directory display is less neatly formatted than the others; however,

the printer output is exactly the same for all versions.

Program Setup

After you have entered and saved a copy of Directory Plus, run the program. It begins by asking whether you want to display the directory on the screen or a printer. Press S for screen output or P for printer output.

If you're using a printer, be sure it is connected properly and turned on before proceeding any further. Directory Plus is designed to work with the following Commodore printers: MPS-801, MPS-802, MPS-803, 1525, and 1526. As listed below, the program is set up to work with the MPS-802 and 1526 printers. If you have an MPS-801, MPS-803 or 1525 printer, remove the keyword REM from the beginning of line 20 (but leave the rest of the line intact).

The program also works as is with non-Commodore printers, but only if your printer/interface combination can emulate Commodore graphics mode exactly. In this case, you should probably remove the REM in line 20 to activate the Commodore graphics mode; however, some interfaces for non-Commodore printers may require that you send additional codes to the interface to put it in Commodore graphics mode. It may also be necessary to add a secondary address to the OPEN statement in line 790. Consult the manuals for your printer and interface if you are in any doubt about the capabilities of your system.

The program can easily be modified to work with printers that

do not support Commodore graphics as well. Simply replace the graphics characters in lines 800-910 with spaces, or use dashes, asterisks, or any other characters you wish.

If you select the printer option when displaying the directory, a second prompt will appear asking you to select the printing width. Press S for a single-width (normal) printout, or D for a double-width printout. Many printer interfaces that support Commodore graphics do not support the graphics characters in double-width mode, so you may not be able to use the D option if you have a non-Commodore printer.

Load Addresses

At this stage the program prompts you to insert the disk whose directory you wish to view. Press any key when the disk is in place. After a pause while the computer reads the disk directory, the program asks whether you want to see the load addresses of any files. To display the directory without any address information, press the 3 key. If you want to see the load address for every file on the disk, press the 1 key. To view load addresses for only selected files, press 2. When this option is selected, the program displays each filename in turn, allowing you to choose whether you want to see its load address; press Y to display the load address of the current file, or N to skip to the next file. Note that some files (data files, for instance) don't contain a meaningful load address. In such cases, no address is displayed.

If you choose to display load addresses, the disk drive spins for a few moments while it retrieves this extra information for each file. You should not continue past this stage until the drive is finished working (when using the 1541 drive, wait until the motor stops spinning; on the 1571, wait until the drive's busy light goes off).

After every prompt has been answered and the drive is at rest, the directory display begins. To slow the scrolling of screen output, hold down the CTRL key on the VIC or 64, the Commodore key on the Plus/4 or 16, or CTRL-S on the 128.

After the directory has been printed on the screen or printer, Directory Plus gives you the option of viewing the same directory again, or of changing disks and printing a directory for the new disk.

Directory Plus does not display information about deleted (DEL) type files. DEL files are rarely of interest; however, if you wish to view them, delete line 870 from the program. Another possible modification involves the drive number. Although the 1541 and 1571 drives are always addressed as drive 0, some Commodore-compatible dual drives include drive 1 as well as drive 0. To access drive 1 in a dual drive system, change the 0 to a 1 in lines 170, 180, and 640.

In general, Directory Plus works by opening the directory as a sequential file and bringing in the contents one character at a time with the GET statement. The manual that came with your disk drive contains additional information about the structure of the directory. For those interested in writing similar programs, here is a brief outline of the major segments in Directory Plus:

Lines	Function
10-160	Initialization
170-230	Read header information
240-480	Read file information
490-700	Read load addresses
710-930	Print directory listing
940-1010	Repeat options
1020-1050	Check error channel

Directory Plus

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing in Programs" in this issue of COMPUTE!.

```

DP 10 NDS=-
AK 20 REM NDS=CHR$(8):REM REMO
VE REM FOR 1525 OR MPS-8
01 PRINTERS
DM 30 DIM FT$(5):FORI=0TO5:REA
D A$:FT$(I)=A$:NEXT
X8 40 DATA DEL,SEQ,PRG,USR,REL
,DEL
BA 50 DIM FS$(144,5)
XE 60 FE=664
DC 70 PRINTCHR$(147);CHR$(30);
CHR$(17);"OUTPUT TO SCRE
EN OR PRINTER (S/P) ?"
8H 80 GETAS:IFAS=""GOTO80
KJ 90 DV=3:IFAS=""P"THENDV=4
QQ 100 IFAS="S"THENGOTO140
KF 110 PRINTCHR$(17)"SINGLE OR
DOUBLE WIDTH (S/D) ?"
KD 120 GETAS:IFAS=""GOTO120
AG 130 BS=CHR$(15):IFAS="D"TH
ENBS=CHR$(14)
AS 140 PRINTCHR$(17)"INSERT DI
SK AND PRESS ANY KEY"
RE 150 GET A$:IF A$="" THEN150
DX 160 PRINTCHR$(145)"PLEASE W
AIT...[15 SPACES]"
EC 170 OPEN15,8,15,PRINT#15,"I
0":GOSUB1020
RS 180 OPEN8,8,8,"$,S,R"
SX 190 GOSUB1020
CR 200 FORI=1TO142:GET#8,A$:NE
XT
AB 210 FORI=143TO160:GET#8,A$:
NS=N$+A$:NEXT
FG 220 FORI=161TO162:GET#8,A$:
ID$=ID$+A$:NEXT
CP 230 GET#8,A$:FORI=164TO165:
GET#8,A$:OS$=OSS+A$:NE
XT
EH 240 FORI=166TO254:GET#8,A$:
NEXT
PQ 250 CT=8
SF 260 NM=NM+1
PX 270 IFCT=8THENCT=1:GOTO300
RH 280 CT+CT+1:GET#8,A$,A$:FL=
ST
GP 290 IFFL<>0GOTO480
EG 300 GET#8,A$:IFAS=""THENAS=
CHR$(133)
XA 310 FL=ST:IFFL<>0GOTO480
MX 320 TY$=FT$((ASC(A$)AND191)
-128)
GD 330 GET#8,A$:IFAS=""THENAS=
CHR$(0)
ME 340 TRS=RIGHT$("[2 SPACES]"
+STRS(ASC(A$)),2)
SB 350 GET#8,A$:IFAS=""THENAS=
CHR$(0)
BB 360 SC$=RIGHT$("[2 SPACES]"
+STRS(ASC(A$)),2)
DM 370 FL$=TY$:(FORI=3TO18:GET#8
,A$:IFL$=FL$+A$:NEXT
SF 380 FORI=19TO27:GET#8,A$:NE
XT
SC 390 GET#8,LB$,HB$.
AE 400 BL=ASC(LBS+CHR$(0))+256
*ASC(HBS+CHR$(0))
MS 410 IFTY$<>"DEL"THENFE=FE-8
L
FC 420 BL$=RIGHT$("[5 SPACES]"
+STRS(BL),3)
HC 430 IFTRS=" 0"GOTO480
DB 440 FS$(NM,0)=FL$+FS$(NM,1)=T
Y$:FS$(NM,2)=TRS:FS$(NM,3)
)=SC$:FS$(NM,4)=BL$.
DK 450 FS$(NM,5)="[5 SPACES]"
PH 460 IFTY$="PRG"THENFS$(NM,5)
="-----"
KC 470 GOTO260
GR 480 CLOSE8
XA 490 GOSUB1020
HR 500 IFFS(NM,0)="THENNNM=NM-
1:GOTO500
SK 510 FE$=RIGHT$("[4 SPACES]"
+STRS(FE),3)
XQ 520 PRINTCHR$(145):"START A
DRESS ":";PRINTCHR$(17)
;" 1) ALL"
MJ 530 PRINT" 2) SOME:";PRINT"
{SPACE}3) NONE"
EK 540 GETAS:IFVAL(A$)=0THENGO
T0540
DS 550 IFVAL(A$)>2GOTO770
MD 560 PRINT"[CLR]":IFAS="1"TH
ENPRINT"JUST A MOMENT..
"
BQ 570 FORI=1TONM
MQ 580 IFFS(I,1)<>"PRG"GOTO700
XK 590 IFAS="1"GOTO630
BS 600 PRINTFS(I,0,"(Y/N)"
PX 610 GETAS:IFAS=""GOTO610
RI 620 IFAS<>"Y"THENPRINT"[UP]
";:GOT0700
QJ 630 SA$=FS(I,0)
EK 640 OPEN 8,8,8,"0:";"+SA$+",P
,R"

```

The Logical Alternative: True-False Logic in Atari BASIC

Ronald R. Lambert

As this article demonstrates, there's a compact and efficient alternative to conventional IF-THEN statements: logical comparisons. The techniques described here work with Atari BASIC on the 400/800, XL, and XE computers—and, with slight adjustments, with all versions of BASIC.

Anyone who has read a BASIC reference manual knows about logical operators such as $>$, $<$, $=$, AND, and OR. These are most commonly used in IF-THEN statements:

IF Y>0 THEN PRINT Y

(X will be printed only if it is greater than zero.)

But there is another way to use logical statements, one that can streamline and shorten programs considerably—especially in Atari BASIC, which allows calculated GOTOS, GOSUBs and RESTOREs.

BASIC tests logical statements to see if they are true or false. In keeping with the principles of Boolean algebra, the value 1 is applied to a statement if it is true, and a 0 is applied if the statement is false. (Some BASICs, such as those found on Commodore computers, the IBM PC and PCjr, and Texas Instruments' TI-99/4A and TI-99/4A+, apply the value 1 to a false statement and 0 to a true statement.)

ments TI-99/4A, apply a -1 if the statement is true.) When the value is true, the statement following the THEN clause in an IF-THEN statement is executed. When the value is false, the program skips to the next line. (Note that the latest BASICs usually let you add an optional ELSE clause to an IF-THEN statement. Execution would then continue with the statement following ELSE.)

The same true-false evaluation also happens with any logical BASIC statement, such as $X=10$. Taken by itself (this may require enclosing the statement in parentheses), a statement like $X=10$ can be used as a variable—a variable that can equal 1 or 0, depending on whether the equation is true or not. Let's see how we can take advantage of this to shorten a program line.

Logic Versus IF-THEN

Instead of this:

100 IF $X = 1$ THEN $X = 0$ END

Try this:

100 $X = X + (X - 10)$

If you're using a BASIC that assigns a -1 to true statements, change the sign of the statement:

$Y=Y-(X=10)$. Subtracting -1 is the same as adding 1.

Both of the above statements mean the same thing and will accomplish the same function: Y is incremented only if $X=10$. In the second example, IF-THEN is replaced by a logical evaluation. If X does not equal 10, then the statement $(X=10)$ has an assigned value of 0, and 0 is added to Y—leaving the value of Y unchanged. Only when X does equal 10 will the statement have a value of 1, causing the value of Y to be incremented.

Not only is the second example shorter, but notice the way it is constructed—the program will not skip to the next line if X does not equal 10, but instead can continue on to read further statements in the same program line. In fact, several IF-THEN statements in effect can be combined into one line, as the following two examples demonstrate.

Instead of this:

```
10 X=X+1:IF X=255 THEN Y=Y+1:  
  X=0  
20 IF Y=255 THEN Z=Z+1:Y=0  
30 IF Z=255 THEN PRINT "DONE"  
 :END  
40 GOTO 10
```

Try this:

```
10 X=X+1:Y=Y+(X=255):X=X-255*  
  (X=255):Z=Z+(Y=255):Y=Y-255*  
  (Y=255):IF Z<255 THEN 10  
20 PRINT "DONE":END
```

(Remember, if you're using a BASIC that assigns -1 to true statements, reverse the signs in the latter example, except for the statement $X=X+1$.)

Again, both of the above examples do the same things. They increment Y by 1 every time the value of X reaches 255 (and also reset X to 0), increment the value of Z every time the value of Y reaches 255 (and reset Y to 0), and then when the value of Z reaches 255, print the message DONE.

In the second example, where logic is used, the statement $(X=255)$ is multiplied by 255 and subtracted from X. As long as X does not equal 255, the value of the statement will be zero. Since 255 times 0 is 0, then 0 is what is subtracted from X, leaving the value of X unchanged. But when X equals 255 and the equation is true, then we have 255 times 1 (or -1, depend-

ing on your computer), which is 255. If X equals 255, then subtracting this value from X changes the value of X to 0. (If you're using a BASIC that assigns -1 to true statements and have changed the signs in the above statements as noted, then -255 will be added to X when X equals 255. Adding a negative number is the same as subtracting.)

The same is true for the statement $Y=Y-255*(Y=255)$. In effect, four conditional statements have been combined into one line.

Logical Branching

As mentioned earlier, Atari BASIC allows calculated GOTOS, GO-SUBs, and RESTOREs. When logical statements are used in these calculations, it is possible to branch to any line in the program depending upon which logical statement is true. This can save substantial amounts of memory. Consider the following program:

```
10 OPEN #2,4,0,"K"  
20 ?"Type S, L, or P?":GET #2,N:IF  
  N=83 THEN 60  
30 IF N=76 THEN 70  
40 IF N=80 THEN 80  
50 GOTO 20  
60 ?"This could be a save to tape or disk  
routine.":GOTO 20  
70 ?"This could be a load from tape or  
disk routine.":GOTO 20  
80 ?"This could be an output to printer  
routine.":GOTO 20
```

If we use logic, the program can be substantially shortened. Delete lines 30, 40, and 50, and replace line 20 with this:

```
20 ?"Type S, L, or P?":GET #2,N:GOTO  
  20+40*(N=83)+50*(N=76)+60*  
  (N=80)
```

The program works exactly the same as before.

Timing Tradeoffs

Substituting logical statements for IF-THEN statements usually slows down an Atari BASIC program, though normally the difference is too slight to matter, especially when the line is executed only once or just a few times. But the difference is measurable when the statements are enclosed in loops.

To demonstrate, following is a short program that counts words in a long text string. (Actually it counts spaces, an easy way to get a fairly accurate word count.) It gen-

erates a long string of text, then uses two of the Atari's internal clock registers to time the two methods for counting. First the words are counted using a conventional IF-THEN construction, and then they're counted using logic.

```
10 DIM TEXT$(2362)  
20 TEXT$="Welcome to the  
Overlook Hotel. All wo  
rk and no play makes J  
ack a dull boy."  
30 TEXT$(2318)=TEXT$(31):  
TEXT$(75)=TEXT$(31):?  
TEXT$  
40 ? :? "Counting...":WORD  
  COUNT=0:POKE 19,0:POK  
  E 20,0  
50 FOR X=1 TO LEN(TEXT$)  
60 IF ASC(TEXT$(X))=32 TH  
  EN WORDCOUNT=WORDCOUNT  
  +1  
70 NEXT X:? WORDCOUNT;" W  
ords counted using IF-  
THEN in ";PEEK(19)*256  
+PEEK(20);" jiffies (i  
nternal timer)."  
80 ? :? "Counting...":WORD  
  COUNT=0:POKE 19,0:POK  
  E 20,0  
90 FOR X=1 TO LEN(TEXT$)  
100 WORDCOUNT=WORDCOUNT+(  
  ASC(TEXT$(X))-32)  
110 NEXT X:? WORDCOUNT;"  
words counted using 1  
logic in ";PEEK(19)*25  
6+PEEK(20);" jiffies  
(internal timer)."
```

When you type in and run this program, it displays for you the word counts and the time required for each count measured in jiffies, which are equal to 1/60 second. In this case, the IF-THEN routine (line 60) runs a little faster than the logical statement equivalent (line 100).

Now that you know how logical statements work, you may take a shine to the kind of programming techniques they make available. They certainly provide a logical alternative. ©

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Commodore *SpeedScript* To BASIC

Frank Colosimo
Mike Kozakiewicz

This utility program provides a convenient way to convert text in a SpeedScript word processing file into BASIC PRINT or DATA statements. The result is a BASIC program which you can load and run as a stand-alone program or add to existing programs of your own. The utility program requires a Commodore 64 or 128 (in 64 mode), a copy of Commodore 64 SpeedScript, and a disk drive. SpeedScript was published in the March 1985 issue of COMPUTE! and also is available in SpeedScript: The Word Processor for the Commodore 64 and VIC-20 from COMPUTE! Books.

One of the first commands a BASIC programmer learns to use is PRINT, yet no matter how advanced you become, formatting a text display with PRINT can involve a lot of trial and error. If you PRINT past the right edge of the screen, words may break in the middle rather than wrapping completely around to the next line. And changing just one PRINT statement can affect the appearance of an entire screen.

"SpeedScript to BASIC" provides an answer for anyone who wants an easy way to format text neatly on the screen. It takes a text file created with Commodore 64 SpeedScript and converts it into PRINT or DATA statements ready to be merged with your own program. Some uses for SpeedScript to BASIC include creating instruction screens for BASIC programs, preparing self-contained educational

or advertising programs, or converting word processing files into BASIC programs that can be read without the use of a word processor.

If you're a nonprogrammer, you may find it particularly useful for turning word processing files into BASIC programs. The programs it automatically generates are completely self-contained and display the text onscreen without use of the word processor itself.

Format Without Frustration

Type in the program listing below, then save a copy to disk. Before you can use the program, you must create a text file for it to process. Load and run *SpeedScript*, then type in as much text as you wish. When that's done, save the *SpeedScript* document as usual, then exit the word processor and load and run this program.

The program begins by asking you whether you want its output in the form of DATA statements or PRINT statements. The answer depends on your goal. The PRINT option is most useful if you intend to add the resulting display routine to an existing program of your own. If you want a stand-alone program, choose the DATA option; this creates an independent program that will display formatted text, one screen at a time, as you press a key.

After choosing the output type, you are asked for the name of the input file. Enter the filename of your previously prepared *SpeedScript* file, then press RETURN. If you're not sure of the exact file-

name, you can enter a dollar sign (\$) to view the disk directory. If you ask for a file that does not exist, the program lets you try again. Enter Q at this prompt if you want to end the program.

The program now reads your word processing file and constructs a series of new BASIC statements in a large buffer area within memory. The file conversion routine is written in machine language for maximum speed. To keep you updated, the program increments the counter display each time it processes another 256 characters of text.

Once the work is done, the program asks you to insert an output disk in the drive. You then enter a name for the output program file to be created. If the file already exists on your output disk, you are asked if you want to erase the existing file. If you choose not to erase, you are asked to enter a new filename. You may also end the program by entering Q at this prompt. The output file is then saved to disk, and you are given the opportunity to save a copy to another disk.

Accurate Reproduction

The result is a set of BASIC program lines which accurately recreate the original text display. Just as in *SpeedScript*, the program wraps words instead of splitting them at the right edge of the screen. It also ignores *SpeedScript* formatting codes, which are relevant only when printing a document on paper. All other characters are faithfully reproduced, except for

quotation marks. Since the PRINT command itself requires the use of double quotes, the program substitutes a single quote wherever a double quote appears in the original text.

Once you learn how easy it is to use, you'll probably find more and more uses for this program. To simplify the job of adding the new program lines to existing programs, the line numbers start at line 10000 and use increments of 10. A 21-block word processing file takes about 38 seconds to be processed into a 26-block BASIC program (not counting the time you spend answering the prompts).

If you're interested in examining the machine language routine that makes this utility work, you can find it at locations 49152 and above.

SpeedScript To BASIC

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing in Programs" in this issue of COMPUTE!.

```
DF 10 IF PEEK(49152)=76 THEN GOTO 40
KD 20 PRINT "[CLR]{2 SPACES}P
ASE WAIT, STORING DATA..
"
HX 30 FOR M = 49152 TO 50153:
{SPACE}READ A:POKE M,A:NE
XT
JM 40 POKES5281,15:POKE53280,0
GK 50 POKES6,PEEK(46)+2:CLR
RG 60 BS$="14{ SPACES}"
AS 70 PRINT "[CLR]{BLK}{RVS}{N}
{3 SPACES}*****{2 SPACES}SPEEDSCRIPT TO
BASIC{2 SPACES}*****{3 SPACES}"
FD 80 LD$=2:GOSUB500:INPUT "DAT
A OR PRINT STATEMENTS{D
/{P}{3 SPACES}D{3 LEFT}","
TYPES
QH 90 TYPES$=LEFT$(TYPES,1):IF(
TYPES<>"D") AND (TYPES<>"P")
THEN GOTO80
JD 100 ADDR=49152:IF TYPES="P"
THEN ADDR=49155
KA 110 CLOSE15:OPEN15,8,15,"I0
"
SM 120 LD$=2:GOSUB500
KR 130 PRINT "[DOWN]INPUT FILEN
AME, $ (DIR), OR Q (QUI
T)"
AP 140 INPUT "{3 SPACES}Q
{3 LEFT}";INS:PRINT "
{CLR}"
CJ 150 IF INS<>"ANDINS<>"Q"
{SPACE}THEN PRINT "[CLR]
{DOWN}{12 RIGHT}READING
FILE...
XQ 160 IFINS="THEN120
BG 170 IF INS="$THENSYS49994:
GOTO130
QF 180 IF INS="Q"THEN GOTO480
MX 190 LD$=2:GOSUB500
HK 200 CLOSE1:OPEN1,8,3,INS:IN
```

```
PUT#15,EN,EMS:F$=INS:IF
EN=0 THEN 220
JS 210 GOSUB550:GOTO120
CE 220 SYS(ADDR):CLOSE1:SYS654
84
QM 230 PRINT "[CLR]"+LD$+11:GOS
U500:PRINT "[10 SPACES]
{RVS}INSERT OUTPUT DISK
{OFF}"+
BJ 240 GOSUB520:ADDR=49158
CD 250 LD$=2:GOSUB500
JH 260 PRINT "[DOWN]OUTPUT FILE
NAME, $ (DIR), OR Q (Q
UIT)"
PC 270 INPUT "[2 SPACES]Q
{3 LEFT}";OUTS:PRINT "
{CLR}"
BC 280 IF OUTS="Q"THEN GOTO480
KG 290 IFOUTS="$THENSYS49994:
GOTO260
PG 300 LD$=4:GOSUB500
FJ 310 IF INS<>"$ANDINS<>"Q"
{SPACE}THEN PRINT "[CLR]
{DOWN}{13 RIGHT}WRITING
FILE...
QE 320 CLOSE9:OPEN9,8,4,"0":+O
UTS:INPUT#15,EN,EMS:F$=O
UTS:CLOSE9
BX 330 IFEN=0 THEN 360
RA 340 IFEN<>62 THEN GOSUB550:G
OTO230
RJ 350 GOTO400
BB 360 LD$=6:GOSUB500:PRINTOUT
$;" EXISTS... REPLACE?
{SPACE}{RVS}Y{OFF}/
{RVS}N{OFF}"+
RG 370 GETAS:IFA$<>"Y"ANDAS<>"N
"THEN370
PA 380 IFAS="N"THEN230
SD 390 PRINT#15,"$0"+OUTS
QS 400 LD$=15:GOSUB500
RM 410 T1=8+LEN(OUTS):BL$=LEFT
$(BS,(20-(T1/2))):PRINT
"[CLR]{$1$:{RVS}SAVING
":OUTS}:{OFF}"
GS 420 GOTO440
EJ 430 PRINT "[CLR]"
RE 440 SYS(ADDR),OUTS:SYS65484
:PRINT "DONE"
DJ 450 INPUT "MAKE ANOTHER COPY
{3 SPACES}N{3 LEFT}";AN
$
GM 460 ANS=LEFT$(ANS,1):IF(ANS
<>"Y")AND(ANS<>"N")THEN
450
KJ 470 IF ANS="Y"THEN GOTO230
JQ 480 POKES6,160
FE 490 FORI=1TO15:CLOSE1:NEXT:
CLR:PRINT "[CLR]":END
MB 500 SYS49161,LD$+
GP 510 PRINT "[HOME]":FORJ=1TO
D$-1:PRINT:NEXT:RETURN
RD 520 PRINT "[DOWN]{8 SPACES}
{RVS}PRESS A KEY TO CON
TINUE"
FC 530 GETAS:IFAN$="THEN530
QJ 540 RETURN
CH 550 PRINT "[DOWN]DISK ERROR
{SPACE}FOR ";F$:PRINTEM
$:GOSUB520:RETURN
CD 560 DATA 76,12,192,76,34,19
2,76,239,194,76,246,194
FS 570 DATA 169,32,141,197,193
,169,218,141,198,193,16
9,193
CQ 580 DATA 141,199,193,169,13
1,141,242,192,208,15,16
2,2
SC 590 DATA 169,234,157,197,19
3,202,16,250,169,153,14
1,242
QE 600 DATA 192,32,168,193,238
,68,192,208,13,32,164,1
94
BD 610 DATA 162,1,32,198,255,7
6,70,192,255,8,32,152
FS 620 DATA 193,133,2,32,183,2
55,41,64,240,3,76,0
JM 630 DATA 193,32,91,192,76,5
2,192,165,2,48,31,32
KM 640 DATA 68,193,201,13,208,
4,32,98,193,96,201,32
MG 650 DATA 208,4,32,123,193,9
6,32,127,192,165,20,201
C8 660 DATA 39,208,3,32,98,193
,96,164,20,153,135,192
KA 670 DATA 230,20,96,0,0,0,0,
0,0,0,0,0
GQ 680 DATA 0,0,0,0,0,0,0,0,0,0,
0,0,0
CX 690 DATA 0,0,0,0,0,0,0,0,0,0,
0,0,0
RA 700 DATA 0,0,0,0,0,0,0,0,32,156
,193,230,21,96
MS 710 DATA 166,20,240,17,162,
0,189,135,192,32,174,19
2
AF 720 DATA 232,228,20,208,245
,162,0,134,20,96,32,212
GG 730 DATA 193,32,216,192,32,
180,192,96,169,0,133,20
PC 740 DATA 169,10,32,156,193,
32,156,193,24,101,158,1
33
ES 750 DATA 158,144,2,230,159,
32,156,193,165,159,32,1
56
MG 760 DATA 193,169,131,32,156
,193,169,34,32,156,193,
169
CD 770 DATA 0,133,21,6,32,91,
192,32,98,193,169,29
RB 780 DATA 32,156,193,169,157
,32,156,193,32,212,193,
32
HM 790 DATA 212,193,32,212,193
,96,169,2,162,8,160,1
RR 800 DATA 32,186,255,32,253,
174,32,158,173,160,0,17
7
BS 810 DATA 71,72,200,177,71,1
70,200,177,71,168,104,3
2
XS 820 DATA 189,255,169,55,164
,196,166,195,32,216,255
,96
GJ 830 DATA 41,64,18,5,2,41,19
1,133,2,41,32,73
CJ 840 DATA 32,10,5,2,201,95,2
08,3,169,13,96,201
QE 850 DATA 34,208,2,169,39,96
,165,20,24,101,21,201
RD 860 DATA 39,176,10,32,180,1
92,32,212,193,32,212,19
2
JR 870 DATA 96,32,202,192,76,1
07,193,24,165,20,161,21
FS 880 DATA 201,39,240,7,176,9
,165,2,32,127,192,32
CH 890 DATA 180,192,96,165,2,3
2,127,192,32,202,192,96
FE 900 DATA 32,207,255,96,160,
0,145,195,238,195,208,2
JF 910 DATA 230,196,96,162,
1,32,198,255,165,55,133
GD 920 DATA 195,165,56,133,196
,169,0,141,238,194,169,
255
XD 930 DATA 141,68,192,32,152,
193,32,152,193,32,218,1
93
```


Apple ProDOS Protector

Jason Coleman

These programs protect your Apple II ProDOS disks against unauthorized use by other people. If you're using DOS 3.3, see the "Guardian Angel" article elsewhere in this issue for a similar protection method.

"Apple ProDOS Protector" lets you protect any ProDOS disk from unauthorized use by others. Three files are required to make this system work. Before getting started, type in and save Programs 1-3 listed below, which are all written in Applesoft BASIC.

To begin the protection process, select the disk you want to protect, then load and run Program 1, "File Creator." The program asks you to enter a unique access code for the soon-to-be-protected disk. The access code can be any length and can contain any combination of letters, numbers, and symbols except for the comma and colon. Be sure to write the access code down for later reference—you may find it difficult or impossible to use the disk without it.

The program then creates a machine language file on disk named START.END.ML. You don't need a copy of Program 1 on the disk to be protected, only a copy of the START.END.ML file created by Program 1.

Next, you are asked to enter the name you wish to use for this disk's startup file. Make a note of this filename as well.

When Program 1 is finished, load Program 2 and save it on the disk to be protected, using the filename you selected for the startup file. Then load Program 3 and save it on the disk to be protected, too, using the filename ENDUP. The disk should now contain these three files:

1. START.END.ML, the machine language file created by Program 1.
2. Program 2, saved with the filename you selected for the startup file using Program 1.
3. Program 3, saved with the filename ENDUP.

This disk is now protected against most users. Only programmers proficient at working with the ProDOS machine language interface (ML) can gain access without knowing the access code.

Using Protected Disks

When a protected disk is booted, the user is asked to enter the correct access code. If the access code is correct, the user is not allowed to use the disk. Anyone who doesn't know the code will not be able to break out of the program by pressing CTRL-C or CTRL-RESET.

When you are finished using a protected disk, load and run the ENDUP program (Program 3) to disable the CATALOG command so other users can't see what's on your disk.

Of course, no protection scheme is foolproof. But you should find this method sufficient to deter most casual users from accessing your ProDOS disks.

For instructions on entering these listings, please refer to "COMPUTE!'s Guide to Typing in Programs" in this issue of COMPUTE!.

Program 1: File Creator

```
11 100 HGR : HGR2 : TEXT : HOME
C5 110 FOR I = B192 TO B225: REA
O J: POKE I,J: NEXT I
B0 120 DATA 32,0,191,128,28,32,1
76,249,173,37,64,240,1,96
,169,22,141,37,64,32,0,19
1,129,28,32,176,249,96,3,
96,0,64,2,0
F4 125 POKE B200,96: CALL B192:A
= PEEK (16421): POKE B20
0,173: POKE B207,A
41 130 INPUT "ENTER THE ACCESS C
ODE WHICH YOU WILL USE TO
ENTER YOUR DISK:";AC$
```

```
14 140 POKE B227, LEN (AC$): FOR
I = B227 TO B226 + LEN (
AC$): POKE I, ASC ( MID$ (
AC$, I - B226)): NEXT I
75 150 PRINT CHR$ (4) "BSAVE STAR
T.EN0.ML,A$2000,E": I
#E 160 HOME : PRINT "ENTER A FIL
ENAME FOR YOUR STARTUP FI
LE (NO LONGER THAN SEVEN
LETTERS)": INPUT SF$: IF
LEN (SF$) > 7 THEN 160
#F 170 PRINT CHR$ (4) "BLOAD BASI
C.SYSTEM,TSYS,A$2000"
50 175 IF PEEK (8192) = 76 THEN
185
DC 180 POKE B677, LEN (SF$): FOR
I = B678 TO B677 + LEN (
SF$): POKE I, ASC ( MID$ (
SF$, I - B677)): NEXT
S3 184 GOTO 190
42 185 POKE B198, LEN (SF$): FOR
I = B199 TO B198 + LEN (
SF$): POKE I, ASC ( MID$ (
SF$, I - B198)): NEXT
B1 190 PRINT CHR$ (4) "UNLOCK BAS
IC.SYSTEM"
85 200 PRINT CHR$ (4) "BSAVE BASI
C.SYSTEM,TSYS,A$2000"
#B 210 PRINT CHR$ (4) "LOCK BASIC
.SYSTEM"
#B 220 NEW
```

Program 2: BOOTUP

```
67 100 QNERR GOTO 1000
75 102 RS = PEEK (1012): POKE 10
12,RS + 10
25 105 HGR : HGR2 : TEXT : HOME
#B 110 PRINT CHR$ (4) "BLOAD STAR
T.EN0.ML"
#C 120 L = PEEK (8226)
C1 130 FOR I = 1 TO L:C0$ = C0$ +
CHR$ (I PEEK (B226 + I))
: NEXT
F2 140 INPUT "ACCESS CODE:";AC$
C5 150 IF AC$ < > C0$ THEN PR# 6
15 160 POKE 1012,RS
#D 165 A = PEEK (48944): POKE B2
21,A
#E 170 CALL B192: HOME : NEW
#F 1000 RESUME
```

Program 3: ENDUP

```
11 100 HGR : HGR2 : TEXT : HOME
#B 110 PRINT CHR$ (4) "BLOAD STAR
T.EN0.ML"
#S 115 A = PEEK (48944): POKE B2
21,A
#T 120 POKE B200,96: CALL B192
#D 130 A = PEEK (16421): POKE B2
0,7,A: POKE B200,173
#U 140 PRINT CHR$ (4) "BSAVE STAR
T.EN0.ML"
#E 150 POKE B207,0
#D 160 CALL B206
#I 170 NEW
```

HOTWARE: Software Best Sellers

This Month	Last Month	Title	Publisher	Remarks	Apple	Atari	Commodore	IBM	Macintosh
Entertainment									
1.		<i>Elite</i>	Firebird Licensees, Inc.	Action/adventure	•		•		
2.	3.	<i>Ultimo IV</i>	Origin Systems, Inc.	Fantasy game	•	•	•		
3.		<i>Jet</i>	SubLogic	Jet simulation			•		
4.		<i>The Bard's Tale</i>	Electronic Arts	Adventure/role-playing game	•		•		
5.		<i>Temple of Apshai Trilogy</i>	Epyx	Fantasy/role-playing game		•	•		
Education									
1.	2.	<i>Math Blaster!</i>	Davidson	Introductory math program, ages 6-12	•	•	•	•	
2.		<i>Music Construction Set</i>	Electronic Arts	Music composition program	•	•	•		
3.	4.	<i>Color Me: The Computer Coloring Kit</i>	Mindscape	Children's artistic tool	•		•		
4.	1.	<i>Typing Tutor III</i>	Simon & Schuster	Typing instruction program	•		•	•	
5.	5.	<i>New Improved MasterType</i>	Scarborough	Typing instruction program	•	•	•	•	•
Home Management									
1.	2.	<i>Print Shop</i>	Broderbund	Do-it-yourself print shop	•		•		
2.	3.	<i>Printmaster</i>	Unison World	Do-it-yourself print shop	•	•	•		
3.		<i>Better Working Spreadsheet</i>	Spinnaker	Spreadsheet	•		•		
4.	1.	<i>The Newsroom</i>	Springboard	Do-it-yourself newspaper	•		•	•	
5.		<i>The Newsroom: Clip Art Collection, Vol. 1</i>	Springboard	Additional graphics	•		•	•	•

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Commodore 128 Machine Language

Part 1

Jim Butterfield, Associate Editor

This article launches a new series on machine language programming for the Commodore 128. In this installment, we'll examine some basic architectural features of the 128, including memory banking, and look at a program that passes information between BASIC and ML.

The Commodore 128 is truly three computers in one—a Commodore 128 when in 128 mode, a Commodore 64 when in 64 mode, and a Z80-based CP/M computer when in CP/M mode. This series of articles discusses programming the computer in machine language in 128 mode.

When in this mode, the 128's 8502 microprocessor can execute the same instructions as the Commodore 64's 6510 microprocessor, and many of the programming techniques used on the 64 work exactly the same on the 128. These articles are directed especially at programmers who need to make the transition from 64 machine language to 128 ML programming. Of course, if you're familiar with 6502/6510 programming, but the 128 is your first Commodore computer, you can still benefit from the information presented here.

Ground Rules

Here are two simple ground rules to keep you out of trouble on the 128:

First, it's important to stay in bank 15 when writing programs with the computer's built-in machine language monitor (we'll explain what a bank is in a moment). This rule is necessary because of the 128's memory architecture, which can be confusing to a beginner. If you choose a bank number lower than 12, you may end up in a machine configuration which has no Read Only Memory (ROM), making it impossible for your program to call any of the computer's built-in ROM routines.

Second, stay away from areas of Random Access Memory (RAM) which are usually safe on the 64. On the 64, for instance, the cassette buffer located at 828-1019 (\$033C-\$03FB) is a good place to put short ML programs, and the free RAM block from 49152-53247 (\$C000-\$CFFF) is ideal for longer programs. Both areas are unusable on the 128, as you'll quickly learn if you try to put ML code there. The lower area contains critical system vectors and subroutines; if you change their contents, the system will crash. The higher area is covered by Kernal ROM; you can't easily put an ML program there and still have access to ROM routines.

Instead, the 128 has safe areas

from 2816-3071 (\$0B00-\$0BFF) and 4864-7167 (\$1300-\$1BFF). The first area is the 128's cassette buffer, and the second area is currently unused by the system. In later articles, we'll provide more details on these rules as well as some exceptions to them.

Why Bank 15?

The 128 is capable of seeing its memory as 16 different banks numbered 0-15. The term *banks* is somewhat misleading, since a bank does not represent a separate 64K block of memory. Instead, each bank represents a different configuration or arrangement of the various available RAM and ROM elements. The bank number determines what the 128 sees within various areas. In some banks, the 128 sees nothing but RAM; in others it sees a combination of RAM and ROM; still other configurations include RAM, ROM, and input/output (I/O) addresses, and so on.

In fact, there are 256 possible memory configurations. Most of these, however, are of little or no use. For example, though you can configure the computer to see only half of its BASIC ROM and none of its Kernal ROM, it's hard to imagine any use for such an arrangement. Commodore has chosen 16 configurations which seem most useful, named the different configurations *banks*, and identified them with numbers from 0-15.

Figure 1 shows the configuration for bank 15. From locations \$0002-\$3FFF there is RAM. The 128 in the computer's name means that the computer has a total of 128K of RAM, which is arranged in two 64K blocks called *RAM 0* and *RAM 1*. Don't confuse these blocks with banks—some RAM from one or both of these blocks appears in every bank, but the amount varies.

The RAM in bank 15 is from RAM 0, the block that holds BASIC program text along with various buffers, vectors, and system variables and subroutines. More about the rest later. For the moment, it's important to notice that a BASIC program's working values—variables, arrays, and strings—are *not* contained in the same bank as the program text itself.

As shown by Figure 1, most addresses above 16384 (\$4000) are seen as ROM. The BASIC interpreter alone occupies a hefty 28K, all the way up to 45055 (\$AFFF). Above that, we have the machine language monitor and operating system (Kernel) interspersed with some I/O addresses and a tiny area earmarked for the memory management unit (MMU).

In the I/O section, from 53248-57343 (\$D000-\$DFFF), all the chips from the Commodore 64 appear in the same addresses. Thus, your favorite 64 POKEs to make sound effects and so forth work exactly the same in 128 mode. There are numerous extra I/O locations to do new jobs, such as controlling the 80-column video chip and reading the extra keys on the 128's keyboard.

At this point, we won't worry about the machinations of the MMU; it's enough to learn that bank 15 provides access to all the I/O chips as well as the Kernel ROM.

When you put a machine language program in RAM 0, you might be tempted to issue a BANK 0 statement from BASIC before you start the program with SYS. After all, bank 0 gives you access to all the memory in RAM 0. Don't do this: It's better to stay in bank 15.

Figure 2 shows the bank 0 configuration. Putting the computer in this configuration will certainly allow it to see your ML program in RAM 0. But the computer can't see

its I/O chips or Kernel ROM. The computer has lots of memory, but no way to communicate with the outside world.

What's the lesson? Stay in bank 15. You are limited to 16K of RAM, but that's plenty for most applications. Later in this series, we'll discuss access to other configurations.

If you don't specify a bank, the computer defaults to bank 15. However, it's prudent to execute a BANK 15 statement just before any SYS from BASIC. This ensures that your program will work even if some other program has left the machine configured for a different bank. As a courtesy to other programmers (and users in general), programs that use other configura-

tions should end by returning the machine to the default bank.

Memory Use In RAM 0

Figure 3 illustrates typical memory usage in the first 16K of RAM 0. Note that there are several unused memory areas available for program storage. Unless you're using a graphics mode, BASIC program space begins at 7168 (\$1C00). (While programming in ML, you might want to avoid using an otherwise handy program known as the DOS Shell; it moves the start of BASIC up to \$5B01 and occupies memory above \$1A00—memory you may want to use for your own purposes.)

Figure 3 also reveals other unused or little-used memory zones. If you don't need to use a tape drive,

Figure 1: Bank 15

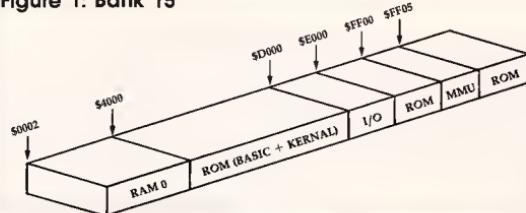


Figure 2: Bank 0

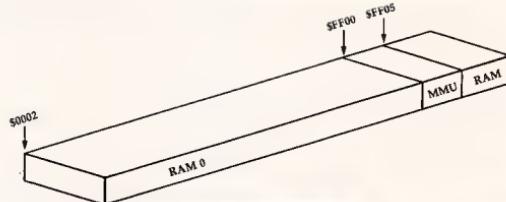
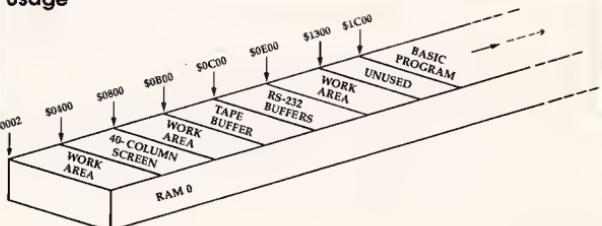


Figure 3: RAM 0 Memory Usage



the cassette buffer from 2816-3071 (\$0B00-\$0BFF) is free. If you aren't using telecommunications, the RS-232 buffers from 3072-3583 (\$0C00-\$0DFF) are also available. And there's a large block of empty memory marked *reserved for applications software* that stretches from 4864-7167 (\$1300-\$1BFF), providing over 2K of contiguous free space.

Friendlier BASIC

BASIC 7.0, the vastly improved BASIC in 128 mode, has several features that simplify the process of combining BASIC and ML. We won't explain all of them in detail, but here is a brief survey. (Your *System Guide* contains additional information.)

In addition to calling an ML routine, the SYS statement can also pass values from BASIC to ML. The values must be in the range 0-255 and are placed in the microprocessor's registers just before the ML routine takes over. Simply tack them onto the end of the SYS command, separated by commas. Conversely, the RREG command lets you read the processor's registers from BASIC after an ML routine has finished.

The BLOAD command can bring in any ML module (or a graphics screen, etc.) with no fuss or bother. The file loads into the same memory area from which it was saved, and BASIC continues with the next command. This is much simpler than the gyrations required in earlier versions of Commodore BASIC.

BASIC 7.0 also makes it easy to convert numbers between decimal and hexadecimal. The DEC function converts a hexadecimal string into a decimal number. The HEX\$ function converts a decimal number into a hexadecimal string.

A Rudimentary Example

The following program isn't particularly useful, but may interest you in the 128's new features. It counts the number of 1 bits in any eight-bit number and prints them out in a table. You may not be excited to learn that the number 14 (binary 00001110) contains three 1 bits, while the number 16 (binary 00010000) contains only one, but

the program does demonstrate how to pass information from BASIC to machine language and back again. We'll explain the purpose of each program line as we go. Here's the first one:

100 BANK 15

This statement puts the computer into bank 15, the safest configuration. Since the ML part of our program won't use any Kernel routines or I/O chips, we could use bank 0. But there's no advantage in doing so, and another time we might not be so lucky. Remember, it's always wise to set the bank explicitly rather than assume everyone's computer will be in bank 15.

**110 DATA 162,0,74,144,1,232
,168,208,249,96**

This is the short ML program, stored in the form of DATA statements. It takes a value from the accumulator (A register), counts the 1 bits in the value, and places the result in the X register.

120 FOR J=2816 TO 2825

The actual ML code goes in locations 2816-2825 (\$0B00-\$0B09), the bottom of the cassette buffer.

**130 READ X:T=T+X
140 POKE J,X
150 NEXT J**

Before the ML can be used, it has to be READ from the DATA line and POKE'd into memory. A simple additive checksum detects most typing errors.

160 IF T<>1334 THEN STOP

If the program stops at line 160, you've made a typing error, most likely in the DATA statements. If not, the ML code is safely planted in memory and we can proceed to the job of bit counting.

200 FOR J=0 TO 20

We're going to count the 1 bits in numbers from 0-20. You can examine higher numbers if you like, but don't try anything over 255.

210 SYS 2816,J

This statement calls the ML program at its starting address of 2816 and passes the value of the variable J to the processor's A register. When the machine language program begins to run, the A register will contain that value. We could also have passed values to

the X and Y registers, but this program doesn't require them.

220 RREG S,T

When we reach line 220, the ML program has returned control to BASIC. We'd like to know what values were in the processor's registers, especially the X register, which contained the bit count. The RREG command reads the registers and places their values into BASIC variables. The A register goes into variable S and the X register goes into T. Now T contains the bit count.

230 PRINT J,T

240 NEXT J

That's all it takes. We print the value of J and the bit count T, then go back to do it again.

Yet To Come

We haven't touched yet on the 128's excellent built-in machine language monitor, nor have we explained how to "break the bank"—free ourselves of some of the constraining features of working with banks. Later in this series, we'll do all of this and more.

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Foolproof Input For Amiga BASIC

Tom Bunker

Here's an extremely handy tool for Amiga BASIC programmers—a routine that creates edit field boxes for accepting various kinds of keyboard input. The routine also demonstrates how well-designed subprograms can, in effect, add new commands to Amiga BASIC.

Amiga BASIC's ability to use custom subprograms is one of its most valuable features: It allows programmers to accumulate a library of very useful routines that can be attached to virtually any BASIC program. The simple requester window subprogram presented in the March 1986 issue of *COMPUTE!* is just one example. Another subprogram that should be in every programmer's collection is a foolproof input routine.

The ideal input routine would simulate the Amiga operating system's own edit field boxes. An example of such an edit field appears when you select the *Save as* option in Amiga BASIC's *Project* menu. A similar routine in BASIC would give your programs much more control than provided by the standard INPUT statement. It would be helpful, for instance, to be able to limit the number of characters that can be entered, or to limit numeric input to integers rather than print error messages after the fact. The input routine shown here has all of these capabilities and more.

Edit Fields In BASIC

The complete input routine consists of two subprograms: "Getline,"

which gets a line of input from the keyboard, and "Box," which Getline calls to draw an edit field box and cursor on the screen. The Box subprogram is very useful in its own right and can be used independently of Getline.

Getline lets you create the equivalent of an edit field box in Amiga BASIC. Here are some of its features:

- The main program which calls Getline sets the maximum length of input allowed.
- The Box subprogram draws an edit field box of appropriate size.
- The cursor inside the box can be flashing or nonflashing.
- The main program can select the type of input allowed: alphanumeric characters, real numbers, or integers.
- The range of alphanumeric characters accepted for input can be adjusted.
- Pressing the ESCape key aborts the input operation.
- A single keystroke can erase all input within the edit field box.
- The main program can display a default entry within the edit field box which the user can edit.

Getline can be used any time your program needs to accept input from the keyboard, for entry of data, filenames, or whatever. To use Getline, your program should first print any desired prompt message and leave the cursor at the point on the screen where input is to begin. Then you must call Getline using this general format:

**CALL Getline (string\$, maxlen%,
inputtype%)**

The string variable *string\$* holds whatever default text you want to display inside the edit field box for the user to edit, and also returns the input entered by the user. For instance, if Getline is called as part of a save-data-to-disk routine, you could suggest a default filename or use a filename which the user has previously indicated. If you don't want to display anything within the edit field box when it appears, set this string variable to a null string ("") before calling Getline. In any case, Getline returns the user's input in this string variable after the subprogram passes control back to your main program.

The second parameter (*maxlen%*) is an integer which sets the maximum input length. For instance, if you want to limit input to 30 characters, you'd specify a 30 for this parameter by supplying either an integer variable or a constant.

The last parameter (*inputtype%*) is an integer which tells Getline which type of input to accept. There are three possible values:

- 0 accepts all alphanumeric characters without restriction.
- 1 accepts real numbers—the digits 0 to 9 and the decimal point.
- 2 accepts integers—only the digits 0 to 9.

The real and integer types also accept the plus and minus signs, but only in the first character position. Getline simply ignores all keystrokes that do not conform to the type of input selected.

Calling Getline

Here are a couple of examples. Let's say you want the user to enter his or her name, up to 14 characters long, and you want your program to store the information in the string variable NAME\$. The proper CALL would be

```
CALL Getline (NAME$,14,0)
```

If you want the user to enter a three-digit integer number (perhaps a telephone area code), the proper CALL would be

```
CALL Getline (NUMBER$,3,2)
```

Note that Getline always returns the user's input in a string variable. If the input you're seeking is an integer or real number, you can convert it from string to numeric form with the VAL function after Getline returns control to your main program.

Remember, too, that Amiga BASIC's CALL statement has an alternate syntax: You can omit the CALL keyword if you delete the parentheses surrounding the arguments. The following statements work the same as the examples above:

```
Getline NAME$,14,0  
Getline NUMBER$,3,2
```

This syntax saves a bit of program space, but also sacrifices a certain amount of program clarity. If you include the CALL keyword, it is always clear to others that the program is calling a subprogram.

Special Keystrokes

When called, the Getline subprogram first draws an edit field box the proper size to hold the input. If the string variable supplied in the call is not a null string (two quotes with nothing between them), the subprogram prints the string inside the box. A flashing cursor indicates that the program is awaiting keyboard input. Like the Amiga operating system's own edit fields, Getline recognizes the following special keystrokes:

- ESCape exits the edit field and leaves the string variable with the value it had when Getline was called.
- RETURN exits the edit field and assigns the user's entry to the string variable.

- BACKSPACE deletes the character to the left of the cursor.
- DEL deletes the entry currently in the edit field.
- CURSOR LEFT moves the cursor one space to the left.
- CURSOR RIGHT moves the cursor one space to the right.

The last four commands, of course, are valid only if at least one character is within the edit field.

Customizing Getline

Note that Getline is designed to work only when Amiga BASIC's default font is used and Preferences is set to 80 columns. If you're using a 60-column screen or a different font, the text doesn't appear properly within the edit field box. You can modify the subprograms to solve this problem if you don't regularly use the default 80-column font.

If you don't want to bother with three parameters every time you call Getline, you can omit either the maximum string length or input type or both, as long as you also delete the corresponding items from the parameter list of the SUB statement. The Getline call can be made as simple as this:

```
Getline NAME$
```

In this case, the SUB statement would have to be changed to look for only one argument:

```
SUB Getline(inputstring$) STATIC
```

Getline substitutes default values for maxlen% or inputtype% when they are missing from the parameter list. maxlen% defaults to 40, and inputtype% defaults to 0 (thus accepting all types of input). You can change these defaults too, if you wish.

Two variables in the Getline subprogram—*asc.low* and *asc.high*—determine the ASCII range of characters that are accepted in the edit field. You can change these variables to make the subprogram accept any range of characters desired, even to the extent of restricting input to only one key. They could also be declared in a SHARED statement and set by your main program.

The ESCape key aborts the input and exits the edit field. If your

main program needs to know whether or not the edit field was terminated by ESCape (as opposed to a RETURN with no other input), add the following line to the Getline subprogram immediately following the SUB statement:

SHARED K

After the subprogram ends, your main program can test the value of K. If K=27, the ESCape key was pressed.

You can also program one or more of the special function keys to work in a similar fashion by adding additional lines directly below the ESCape key line to test for any other ASCII value. For example, the addition of this line:

```
IF K=-129 AND K<-138 THEN EXIT  
SUB
```

makes all the function keys abort the input like ESCape. Your main program could then test to see if K is equal to the ASCII value of any of the function keys and take whatever action is desired.

By deleting a single line as instructed by comments within the subprogram, Getline will always start with an empty string. Other comments show how the flashing cursor can be changed to a non-flashing cursor and how the box around the edit field can be eliminated. To make these changes, it's not necessary to actually delete the lines which are indicated. Simply insert a REM at the beginning of the line to disable it; this has the same effect and is more easily reversed.

The Box Subprogram

To draw the box around the edit field, Getline calls the Box subprogram. This subprogram selects a rectangular area of the screen and alters it in one of four ways. You may find this technique useful for other purposes as well. Here is the general format of the Box subprogram call:

```
CALL Box (wide%,high%,border%,  
mode%)
```

or

```
Box wide%,high%,border%,mode%
```

The first two parameters (wide% and high%) set the size of the boxed area by specifying the width and height in number of characters. The third parameter

(border%) changes the size selected by increasing or decreasing the area on all four sides by the number of pixels specified. If this argument is 0, the perimeter of the area falls on the character boundaries. The last parameter (mode%) can range from 0 to 3:

0 fills the box interior using a PATTERN statement.

1 inverts the interior of the box.

2 outlines the area using the foreground color.

3 fills the box interior using the foreground color.

The Box subprogram can be very useful when you want to erase a word or clear any rectangular section of the screen. Consider this statement:

```
COLOR background#:Box 30,1,0,3
:COLOR foreground#
```

This erases a section of the screen 30 characters long without affecting any surrounding text. It sets the foreground color equal to the background color, fills the area, and resets the color. Of course, you can achieve the same effect by printing spaces, but the Box subprogram works much faster.

Getline Input Routine

Note: The left-arrow symbols in the listing indicate when to press RETURN at the end of each program line. Do not attempt to type the arrows themselves.

```
SUB Getline(inputstring$, maxlen
gth$, type$) STATIC
'Value of type$ should be 0 for
character, 1 for real, 2 for integer
'Set default maximum length:
defaultlength=404
IF maxlenlength$=0 THEN maxlenlength$=
defaultlength
y=CSRLIN;x=POS(o):a$=""  

asc.low=32:asc.high=125 'Set ASC II limits
'Delete next line to disable edit mode:
a$=inputstring$ +
cursor=LEN(a$):strlength=LEN(a$)
'Delete next line to eliminate input box:
Box maxlenlength$,1,2,2
Print.line$:
LOCATE y,x:PRINT a$+SPACES$(maxlength$-LEN(a$))
Getkey$:
KEY-INKEY$ 4
'Delete next line for nonflashing cursor:
count=count-1
IF count<=0 AND cursor<maxlength$ THEN
LOCATE y,x+cursor:Box 1,1,0,1
count=100 'Set cursor flash rate
:4
```

```
END IF*
IF k$="" THEN Getkey$
k=ASC(k$):count=0
IF k=13 THEN inputstring$=a$:GOT
O Done 'Return key
IF k=27 THEN Done 'Escape key
IF k>=asc.low AND k<=asc.high AN
D strlength<maxlength$ THEN
IF type$>0 THEN 'Check if real o
r integer
IF k<43 OR k>57 OR k=44 OR k=47
THEN Print.line$
IF (k=43 OR k=45) AND cursor>0 T
HEN Print.line$
IF type$>1 AND k=46 THEN Print.1
ine$
END IF
LOCATE y,x+cursor:cursor=cursor+
1:strlength=strlength+1
a$=LEFT$(a$,cursor-1)+k$+MID$(a$,
cursor)
PRINT MID$(a$,cursor):GOTO Getke
y$
END IF*
IF k=31 AND cursor>0 THEN 'Curso
r left:
cursor=cursor-1
ELSEIF k=30 AND cursor<strlength
THEN 'Cursor right:
cursor=cursor+1
ELSEIF k=127 THEN 'Delete entry:
a$="":cursor=0:strlength=0
ELSEIF k=8 AND cursor>0 THEN 'Ba
ckspace key:
cursor=cursor-1:strlength=strlen
gth-1
a$=LEFT$(a$,cursor)+MID$(a$,curs
or+2)
END IF*
GOTO Print.line*
Done:*
LOCATE y,x*
PRINT inputstring$+SPACES$(maxlen
gth$-LEN(inputstring$))
END SUB*
```

```
*
SUB Box(widet$, height$, border$, m
ode$) STATIC
'widet and height$ set size expres
sed as number of characters
'border$ is to be given as numbe
r of pixels
'mode$ - use 0 for pattern fill;
1 to invert area
'mode$ - use 2 for area outline;
3 to fill area with foreground c
olor
y=CSRLIN*8-9-border$:y1=y:IF y1<
0 THEN y1=0
x=POS(o)*8-9-border$:x1=x:IF x1<
0 THEN x1=0
x2=x+widet$*8+1+2*border$ +
IF x2>=WINDOW(2) THEN x2=WINDOW(
2)-1
y2=y+height$*8+1+2*border$ +
IF y2>=WINDOW(3) THEN y2=WINDOW(
3)-1
IF x1>x2 THEN x1=x2
IF y1>y2 THEN y1=y2
IF mode$=2 THEN LINE (x1,y1)-(x2
,y2),:b:EXIT SUB
IF mode$=3 THEN LINE (x1,y1)-(x2
,y2),:bf:EXIT SUB
AREA (x1,y1):AREA (x2,y1):AREA (
x2,y2):AREA (x1,y2)
AREA.FILL mode$*
END SUB*
```

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The Screen Machine II

Part 2 Pull-Down Menus In IBM BASIC

Charles Brannon, Program Editor

Last month we presented "The Screen Machine II," a full-featured drawing program for the IBM PC and PCjr. Pull-down menus make it quick and easy to use. Many programmers would like to add user interface tools like pull-down menus to their own programs, so this month we'll take a look at the techniques used in Screen Machine II. The programs require an IBM PC with color/graphics adapter and BASICA or a PCjr with Cartridge BASIC. A joystick or graphics tablet is optional but recommended.

operate a personal computer. Since the Apple Macintosh was introduced in 1984, nearly a million Macs have been sold. The basic principles have been adapted by the Atari ST series and Commodore Amiga, and several similar shells are available for IBM PC computers—including Digital Research's *GEM*, IBM's *Topview*, and Microsoft's *Windows*. Even the older eight-bit computers, such as the Commodore 64, are being updated with visually oriented operating systems like *GEOS*.

Those who prefer this style sometimes say that the best advantage of the visual interface is that it makes you feel as if you have a tangible presence within the computer. Instead of viewing yourself as a somewhat remote user of the machine, an operator at a terminal, you feel more like a part of the system. Your sense of flow is enhanced because you can instantly recognize graphic metaphors (such as a picture of a disk) or simply scan through pull-down menus to see what commands are available and appropriate.

A drawing program that takes advantage of this approach lets you preview the figures you're drawing before you actually set them in stone (or phosphor). For instance, using a mouse controller, joystick, or graphics tablet, you can move the pointing arrow across the

screen canvas, then click a button to set one endpoint of a line. Now, as you move the pointer, a "rubber-band" line is drawn between the first point and the current cursor position. You can move the line around, changing its orientation and length, until you've put it right where you want it. Then you press a button again to stamp it down. Of course, if this still isn't what you want, an Undo command could restore the screen to its former state.

If you've never had a chance to work with pull-down menus, you might not appreciate their advantages. Since the menus let you both view and execute the program's commands, they serve two functions: They provide a way to use the program while acting as built-in documentation. Menus that drop down from the top of the screen let you work with nearly the full screen area, instead of cluttering it up with help screens or conventional menus.

On the other hand, if you prefer a written approach to communication, you may find the act of scurrying around a dynamic screen to be clumsy and inefficient, particularly if you have little trouble memorizing lots of commands and typing at least 30 words per minute. A program that seeks to keep everybody happy can provide alternative keyboard commands as well as menus and icons.

"The Screen Machine II" is a powerful graphics program that lets you draw in full color with a complete set of drawing tools. It is designed to be as easy to learn as possible without encumbering advanced users. Last month in Part 1, we listed Screen Machine II without REMarks for the sake of brevity. This month, we're publishing the fully commented version with an explanation of how you can use the menu subroutines in your own programs. See Part 1 for an explanation of how to use Screen Machine II.

Why A Visual Interface?

The visual user interface—consisting of pull-down menus, icons, and screen windows—is rapidly becoming the most popular way to

Programming Menus

Writing a program which incorporates a visual user interface can be tricky. The newest Microsoft BASICs—such as Microsoft BASIC for the Macintosh and Amiga BASIC—have built-in commands to create and manage pull-down menus. Creating a menu is as simple as listing the text in a series of MENU statements. There are even ON MENU GOSUB statements which set up *event traps* (BASIC interrupts) to detect menu selections. Other commands, such as ON MOUSE GOSUB, let the program read the pointing device and respond to button clicks.

IBM BASIC lacks these features, but does include event-trapping statements like ON STRIG GOSUB for the joystick. This makes it possible to simulate the operations which are handled automatically by the newer BASICs. When the user clicks the selection button on the pointing device, the program has to check to see if the pointer is within the menu bar (the first line of the screen). If so, it then checks to see if the arrow is pointing at one of the menu titles. If so, the program drops down the menu (saving the screen contents of the area overwritten by the menu box), and again checks the pointer position to see which menu item is being pointed at. The program highlights the item, and then unhighlights it if the pointer moves away from the item. Finally, when an item is selected (or when the menu selection is canceled), the program has to remove the menu from the screen, restoring the screen contents overlapped by the menu.

Again, all of these details are handled for the programmer in Macintosh and Amiga BASIC. Nevertheless, with enough programming, you can do the same thing in IBM BASIC. The key is being able to drop down a menu and then later restore the part of the screen overlapped by the menu.

BASIC's GET and PUT commands are the solution: GET is used to copy a rectangular portion of the screen into a storage array, and PUT copies the image from the array back to the screen. Naturally, this technique requires using a

graphics mode, since you can't GET or PUT with the text screen. However, with a machine language routine to buffer part of the text screen, this method could be adapted for use with a text-only display adapter.

Simulated MENU Commands

Screen Machine II demonstrates how this technique works. It contains several subroutines which simulate the MENU commands and event traps found in Macintosh and Amiga BASIC. Fortunately, you don't have to know about the inner workings of these subroutines to use them in your programs. There are a few variables and arrays that need to be defined (some of these are initialized automatically), but you need only three GOSUBs to do everything:

GOSUB 11000 is used to add a menu title or menu item to the list of menus.

GOSUB 14000, used within a loop, tracks the arrow pointer and continually checks for a menu selection. If a menu is selected, it automatically handles the mechanics of dropping down the menu, getting a selection, and then restoring the screen. You then examine the variables MNID (menu id) and MNIT (menu item) to see which, any, menu item was selected.

GOSUB 20000 reads the pointer position and optionally tracks the cursor automatically.

Essentially, these subroutines are substitutes for the MENU command, MENU function, and MOUSE function built into Macintosh and Amiga BASIC. Therefore, they can be very handy for translating Macintosh and Amiga programs into IBM BASIC.

A few other useful subroutines let you turn the cursor on or off and print text on the graphics screen in reverse-video. All of these routines let you set variables to allow special options or fetch additional information. Most importantly, they are designed to be used with any program, not just Screen Machine II, so you can easily add them to an existing program or use them as a starting point for your next project.

Screen Machine II is far too large to cover in detail, but the list-

ing below (Program 1) is liberally commented with REMs. By following these comments you can easily deduce the flow of the program. If you didn't type in the program last month, you can enter this listing and omit the comments without ill effect. (Aside from the remarks, this month's program is identical to last month's.) In fact, the remarks take up too much memory to allow the program to run. If you type in the program as listed, use Program 2, "REMover," to remove all the remarks to create a runnable version.

REMover can be used to strip comments from other IBM BASIC programs, too. When you run REMover, first enter the name of the program you're deleting the REMs from, followed by a unique filename for the REMless program to be created. You then have two options. Option 1 changes all REM statements into a single apostrophe (the abbreviation for REM). This preserves the line in case it is the target of a GOTO or GOSUB (not a problem with Screen Machine II), but deletes the text of the remark. Option 2 deletes all REM or apostrophe statements, and if the REM is the only statement in the line, deletes the entire line as well. It's not safe to use Option 2 on programs that may branch to a line beginning with a remark, but it works just fine with Screen Machine II. Be sure you keep a copy of your unprocessed, remarked program for future reference.

Using Menus In Your Program

You can detach the menu package from the rest of the program either by deleting everything except lines 10000-21040, or by saving just the menu lines to disk as an ASCII file suitable for merging with another program. Just enter

LIST 10000-21040,"MENU.PAK"

to create an ASCII file on disk called MENU.PAK. You can then type MERGE "MENU.PAK" to add these lines to an existing program. If you are starting from scratch, type LOAD "MENU.PAK".

Before your program can call the menu package, you need to initialize certain variables. These variables are shown in lines 210-340 of

the Screen Machine II listing. See the section on GETXY below to see how to set ACC, DACC, FROZEN, XMAX, YMAX, XOFF, and YOFF. Check the section on CURSOR_ON and CURSOR_OFF for information on setting the CURSOR flag. Finally, you can choose sound effects by setting SNDFX to -1. If you set it to zero, no sound is used.

Lines 9000-9340 illustrate how to define your menu structure. For example, the DATA statements for the Picture menu are

```
DATA 1,0,1,"Picture "
DATA 1,1,1,"Undo U"
DATA 1,2,1,"New N"
DATA 1,3,1,"Open O"
DATA 1,4,1,"Save S"
DATA 1,5,1,"View V"
DATA 1,6,1,"Quit Q"
```

The first number is the *menu-ID*, the number specifying which menu is being defined. It must be at least 1, and less than 9 (unless you change line 11000 to allow more than 8 menus and/or more than 8 items in each menu). The next number is the *menu item*. A menu item of 0 defines the title of the menu, and other numbers specify the name of each item within the menu. The next number is a *status flag* for that menu item. A value of 1 is normal. Use 2 to display a checkmark next to an item.

The Ghost In The Machine

For example, the Tools menu puts a checkmark next to the currently selected tool. This allows a menu to be used to select items, show which commands are available, and show the status of each menu item.

When you specify a value of 0 for the menu status flag, that menu item is *ghosted out*, or dimmed. A ghosted item is still readable, but the text is distorted, indicating to the user that this particular command is currently disabled or not appropriate at the current time. This helps users avoid confusion over what they can and cannot do in a given situation—they can always access a command unless it's ghosted out.

There are many times when a program would want to change these assignments, depending on program context. For instance, after you select a new tool, the previous tool is reset to a flag of 1 (normal), and the new item is set to 2

(checked). In the Preferences menu, some of the menu items—such as Bkgd Color—are ghosted out when you are in 640 × 200 mode (because you can't change the screen color in this mode), but revert to normal when you select another graphics mode.

Initializing Menus

Here are descriptions of all the major routines in Screen Machine II:

11000 MENU To initialize or change the value of a menu item, assign values to the variables MNID, MNIT, and MNSTR\$, then GOSUB 11000. MNID holds the number of the menu (1-8); MNIT holds which menu item is being changed (0-8, where 0 is the menu title); and MNSTR\$ is the text displayed as the menu title or menu entry. A program can modify all of these items at any time, changing the appearance of the menu when it drops down.

The subroutine at line 9000 in Screen Machine II can be used as a model for initializing your own menus. This routine stores the values in the arrays MTITLE\$, MFLAGS, and MITEMS. It stores the number of the highest menu-ID used so far in TOPID to find out how many menus there are. The one-dimensional array MITEMS holds the number of menu items in each menu. MTITLE\$ and MFLAGS are two-dimensional arrays that use MNID and MNIT to point to the title string and flag setting for a menu item. Hence, MFLAGS(1,2) holds the status flag value of menu 1, item 2. MTITLE\$(3,0) holds the title of the third menu.

It can be convenient to assign values to these arrays directly—for example, when you just want to change one menu item's status flag. MFLAGS(3,4)=0 would ghost out the fourth item of the third menu. You could change it back to normal with MFLAGS(3,4)=1. Or you might want to change the text of a menu entry by modifying the MTITLE\$ array. For instance, a menu item could initially read SOUND ON, then change to SOUND OFF after you've turned on the sound. This is an alternative to using the checkmark, but it can be confusing. Does SOUND ON imply that the sound is already on, or that the item

will turn on the sound? Most programs use checkmarks to avoid this confusion.

12000 MENU_REFRESH Use GOSUB 12000 to display the title bar of your menus after you've initialized them after successive calls to the subroutine at line 11000. Your program should try to avoid using the top line of the screen, but you can always use GOSUB 12000 to redisplay the menu bar if the top line is lost. This routine also links in the positions of each menu item so that the MENU_POLL routine (line 14000) can figure out which menu you are pointing at. These positions are stored in the MX array.

13000 RVMSG\$ There is no easy way to print reverse-video text on the IBM graphics screen, but this is the effect we want when we highlight a menu title or menu entry. The menu bar is also printed in reverse. To display reverse text, set MSG\$ to the text you'd like to PRINT, then GOSUB 13000. This routine prints the text, uses GET to copy the text into an array, then uses the PRESET option of PUT to stamp down a reverse copy of the text.

14000 MENU_POLL This is the workhorse of the menu package. When you call this routine, it checks to see if the pointer is pointing at a menu title and the button is pressed. If not, it just RETURNS, leaving the variables MNID and MNIT set to 0. Otherwise, it drops down the menu, gets the selection, and exits with MNID and MNIT set to the value of the menu-ID and menu item. If the user canceled the selection by moving outside of the menu box, MNIT and MNID are reset to 0.

This routine uses simple sound effects as additional audio cues for the user. If you set the variable SNDFX to 0, you won't get sound effects. If you want them, set SNDFX to -1.

This routine also preserves your screen display and cursor position. If the keyboard is used for menu selection, the keyboard offset (see below) is increased to speed up movement between menu items.

Be aware that this routine works like INKEY\$—if there is no menu selected yet, it immediately

RETURNS. You need to continually call this routine within a loop until MNIT is nonzero, meaning that a menu has been selected. The cursor arrow is updated automatically throughout the menu selection process. Even if no menu is selected, calling this routine continually calls the GETXY routine at line 20000 to update the cursor position.

15000 This subroutine is used only by MENU_POLL to flash a selected menu item.

16000 MENU_DOWN Given a value in MNID, this routine drops down the indicated menu, saving the screen contents erased by the menu in the MSAVE% array (initialized in line 11010). This routine is really only called by the MENU_POLL routine when a menu has been selected, but you may be able to use it for some special effects. To remove the menu, be sure to use the next routine, MENU_AWAY, to discard the menu and restore the screen contents.

17000 MENU_AWAY Again, this is really only used by MENU_POLL to roll away the menu after the user has made a selection. You can use it to remove the menu and restore the screen if you used MENU_DOWN to drop the menu yourself.

Cursor Routines

18000 CURSOR_ON

19000 CURSOR_OFF The arrow pointer is defined in this program in the subroutine at line 3000, used to select various graphics modes. You could excerpt line 3050 (as long as you remember to DIM ARROW% (32) at the start of your program) to use this cursor in your own program. Otherwise, draw your cursor on the screen and use GET(x1,y1)-(x2,y2),ARROW% to copy the cursor into the ARROW% array (x1,y1, and x2,y2 are opposite endpoints of an imaginary rectangle that should completely enclose the cursor shape). The GETXY routine (20000) needs to know the width and height of the cursor, so store these values in XARROW and YARROW.

The cursor is animated with the XOR option of PUT. When you PUT the arrow, it combines itself with the existing screen display so that it is always in contrast. Just

think of the cursor as a stamp that uses "negative ink"—ink that reverses the color of anything it touches. For example, a white arrow on a black background would be white, but on a white background would be black. The magic of XOR is that when you PUT the shape back down on top of itself, it reverses the action, removing the arrow and restoring the previous screen contents. Although PUT with XOR can be flicker-prone, you can reduce the flicker by increasing the delay between drawing the arrow and erasing it.

You don't have to worry about updating the arrow cursor yourself. As long as you continually call either MENU_POLL (14000) or GETXY (20000), the arrow position is updated while the routine is checking the pointer position. But you have to remember to remove the arrow from the screen before you draw anything that might overlap the arrow. If you drew a white line through the cursor while it was resting on a white area, you've drawn a white line through the black arrow. When the arrow is PUT back on top of itself to erase the arrow, the conditions are no longer the same. The cursor reverses itself, so the cursor is gone, but you're left with a black line where the cursor used to be (remember the "negative ink" analogy).

Therefore, your program needs to erase the cursor from the screen before drawing anything. After you've drawn your figure, you can turn the cursor back on, or just allow GETXY (20000) to turn it back on automatically the next time you check for the cursor position.

So use GOSUB 19000 to turn off the cursor, and GOSUB 18000 to turn it back on. This is not the same as setting the CURSOR flag (see GETXY below). The CURSOR flag prevents or enables automatic cursor updates, but doesn't graphically affect the display. However, you should turn off the cursor with GOSUB 19000 before you turn off the cursor flag. If this seems confusing, examine the drawing routines in Screen Machine II (lines 1000-1660) to see how this is done.

20000 GETXY This routine is the core of the whole package. It is used any time a routine wants to know

where the cursor is pointing. As part of the normal checks for the joystick position, it can also update the cursor automatically. To get automatic cursor tracking, be sure to set the CURSOR flag to -1; otherwise you are responsible for your own cursor movement. For use with a joystick or graphics tablet, this routine converts the joystick/tablet values to actual screen positions by multiplying the controller position times the values XRATIO# and YRATIO#.

XRATIO# and YRATIO# are the horizontal and vertical size of the screen divided by the maximum X and Y values of the controller (the lower-right position). When multiplied by the joystick value, these values scale the joystick values to actual screen coordinates. A range of 0-255 multiplied by 1.251 (319/255) gives us a range from 0-319.

Set XRATIO# to the horizontal size of the screen divided by the maximum value of the controller. If the maximum value of the joystick is 132, and you're working with the 320 X 200 mode, then XRATIO# = 320/132. Similarly, YRATIO# is the number of rows divided by the maximum vertical position of the controller, as in YRATIO# = 200/130.

Reading The Pointing Device

XOFF is the minimum horizontal value of the joystick, and YOFF is the smallest vertical value returned by the joystick. You can test this by pushing the joystick to the upper-left corner, then executing PRINT STICK(0), STICK(1). Similarly, you can move the joystick to the lower-right corner and PRINT STICK(0), STICK(1) to assign default values to XMAX and YMAX as shown in lines 230 and 240. Screen Machine II illustrates how to set these values in the screen setup routine at line 3000. Also, the Calibrate function from the Preferences menu (refer to lines 2440-2510) is used to read the values of XMAX, YMAX, XOFF, and YOFF.

XOFF and YOFF, the minimum (top-left) values of the controller, are used to adjust the calculations, as well as to check whether a stylus is pressed against a graphics tablet

surface. For example, the KoalaPad usually returns 7 and 7 as its X and Y values when there is no surface contact. This can be used as a convenient shortcut. While in drawing mode, for example, you start drawing by clicking the button, and stop drawing by either clicking the button again, or simply moving the stylus off the tablet surface.

Another note about the KoalaPad: It is extremely sensitive to glitches unless you bear down on the tablet with firm pressure. Unfortunately, pressing too hard will score the tablet surface. If you don't press hard enough, the values jitter uncontrollably. Fortunately, BASIC is too slow to notice most of these glitches, which occur for a fraction of a second before the values reset to normal. If you compile the program, though, it is much more sensitive to these glitches. An averaging routine could be used to detect the glitches and ignore them, but would greatly slow down the uncompiled program.

For keyboard control, GETXY allows the cursor keys to be used to move the cursor. If the keyboard was used instead of the controller, the variable KEYSYMBOL is set to -1; otherwise KEYSYMBOL is reset to 0 when the joystick or graphics tablet is used.

Cursor movement can be very slow, though, if you are moving only one pixel at a time. You must set the variable DACC to the number of pixels you'd like the pointer to move each time a cursor key is pressed, and initialize the variable ACC to this value. If the key is pressed successively or held down until it repeats, ACC counts up, accelerating the speed of the arrow cursor. When the key is released or a different key is pressed, ACC is reset to the value of DACC.

On the other hand, if DACC is a negative quantity, no acceleration is performed. Every keypress just advances the cursor by the absolute value of DACC (as if it were positive). You can change these values throughout your program depending on the context. The MENU_POLL routine sets DACC to -8 during menu selection so that the cursor keys move by one screen line at a time without accelerating.

Reading The Keyboard

If the flag FROZEN equals -1, the joystick or graphics tablet is ignored in favor of the keyboard. Do this when you need keyboard control while the joystick is plugged in. Although the keyboard is always active, it attempts to increment or decrement the values of MX and MY, but these variables are continually reset to the scaled value of the joystick position. With the graphics tablet, we can tell if the stylus is pressed down and ignore the tablet position if it isn't. So the keyboard and tablet work interchangeably, but you need to set FROZEN to -1 if you want keyboard control only while ignoring the joystick.

Line 20050 checks for keyboard equivalents that indirectly activate menu entries. Most commands in Screen Machine II have keyboard equivalents—O for Open, L for Lines, CTRL-N ("N") for New, etc. In addition to streamlining the program for advanced users, keyboard commands satisfy those who are uncomfortable with pointing and clicking. If you don't mind memorizing every keystroke, you don't really need menus. However, not every menu item is always represented by a keystroke, and it's hard to find unique assignments for every menu item.

You really don't need to bother with keyboard equivalents, but if you want them, initialize the string CM\$ as illustrated in line 9060. For each keyboard equivalent, include the keyboard character followed by the digit of the menu-ID and the digit of the menu item for that menu selection. This limits you to nine menus and items, but makes keyboard checking quick. INSTR\$ is used to instantly find out if the command key is part of CM\$, and just as easily retrieve the subsequent values of MNID and MNIT. Strictly speaking, this line does not really belong in GETXY, but we need it here to use the same keystroke that GETXY uses to check for a cursor key.

Study the program listing for more ideas. Since nearly every line is commented, it should be easy enough to follow. We would be interested in seeing the kinds of programs you develop using these techniques.

Quick Reference To Subroutines

12000 MENU_REFRESH

Uses MNID, MNIT, and MNSTR\$ to initialize a menu item.
MNID: Which menu
MNIT: Which menu item
Fills the arrays MTITLE\$(), MFLAGS(), MITEMS()

13000 RVMSG\$

Displays MSG\$ in reverse video at current cursor position.

14000 MENU_POLL

If a menu item is found, returns menu-ID in MNID and menu item in MNIT; otherwise MNID=0 and MNIT=0.

18000 CURSOR_ON

If the cursor flag is set (CURSOR<>0), draws pointer cursor and tells the package that the cursor is on the screen by setting TOGGLE=1.

19000 CURSOR_OFF

If the cursor flag is set (CURSOR<>0), removes pointer cursor from screen and tells the package that the cursor is not on the screen by setting TOGGLE=0.

20000 GETXY

Polls keyboard and optionally the joystick (if FROZEN=0). See text for necessary initialization. Returns MX, MY, MB (mouse/joystick position and button status). If CURSOR flag is nonzero, automatically updates an arrow cursor at position MX, MY.

For instructions on entering these listings, please refer to "COMPUTE!'s Guide to Typing In Programs" in this issue of COMPUTE!.

Program 1: The Screen Machine II

```

N 100 'Screen Machine II
S 110 'Requires CGA or PCjr, AB
ASIC 2.x or Cartridge BASIC
IC
HA 120 DEFINT A-Z
CP 130 'Test for PCjr
PA 140 PCJR=0:ON ERROR GOTO 150:
SOUND OFF:CLEAR ,,,32768:
:DEFINT A-Z:PCJR=-1
JF 150 IF NOT PCJR THEN RESUME 1
60
D 160 ON ERROR GOTO 0
H 170 '
OL 180 'Constants used by menuin
g package:
H 190 '
M 200 'To compile this program,
remove apostrophe from f
ollowing line, delete lin
e 11010
OK 210 'DIM MTITLE$(8,8),MFLAGS(
8,8),MITEMS(8),MSAVEX(160
8),mx,my:TOPID=0
AF 220 DIM ARROWX(32),ZZTEMPY(64
8):'reserve memory for cu
rson, temp use
N 230 'XMAX=100:YMAX=100:XOFF=7:
YOFF=3 'recommended for joysticks.
FF 240 XMAX=250:YMAX=230:XOFF=7:
YOFF=7 'recommended for u
se with touch tablet
AH 250 HIGHLIGHT=2 '# of flashes

```

when menu item selected

00 260 TRUE=-1:CURSOR=TRUE 'enables automatic arrow cursor

MP 270 KEY OFF:SCREEN 0,0,0:WIDT H 40:COLOR 1,1:CLS:LOCAT E 4,11,0:COLOR 12:PRINT "SCREEN MACHINE II"

MP 280 LOCATE 7,12:COLOR 10:PRIN T"Charles Brannon"

K0 290 COLOR 14:LDCAFE 13,10:PRI NT"One moment, please..."

XH 300 GOSUB 9000 'initialize the menus

OK 310 SMODE=1:COLR=1:GOSUB 3000 'sets up screen, XRES,YR ES,MAXCOLOR,SWIDTH,ARROWS cursor

MH 320 SNDFX=TRUE 'set to non-zero for sound effects

IP 330 ACC=1:DACC=1 'DACC is #pixels moved per keystroke. If negative, makes keybo ard movement constant, else allows acceleration

00 340 FROZEN=0 'if frozen true (<1), joystick or touch tablet is ignored in favor of keyboard input

HA 350 ,

LH 360 'Program starts here

HE 370 ,

FI 380 COLR=1:TDDL=1 'current color, drawing action

OP 390 STRIG ON 'enable mouse button

ID 400 MX=XRES/2:MY=YRES/2:NX=MX :NY=MY:GOSUB 19000 'turn on cursor initially

JJ 410 DIM UNDO%(15000) 'buffer portion of screen

HL 420 ,

FJ 430 'Main loop:

HP 440 ,

EI 450 WHILE TRUE 'i.e. forever, if true=-1

BH 460 GOSUB 18000:MB=0:MNID=0

CM 470 WHILE MNID=0 AND MB=0 'while there's no menu selection and no button press

LF 480 GOSUB 14000 'poli menus

BH 490 WEND

GP 500 IF MB<>0 THEN GOSUB 1000 'draw

BM 510 IF MNID THEN GOSUB 2000 'process menus

EM 520 WEND

HO 530 ,

00 1000 WHILE MB:GOSUB 2000:WEN D 'wait for button release

NH 1010 GOSUB 19000 'turn off cursor

AC 1020 IF MY>=CY THEN COLR=INT(MX/XR#):GOSUB 6000:RETUR N

EC 1030 GET (1,B)-(XRES-2,CY-1), UNDO% 'save screen in undo buffer.

IC 1035 SCMS=CM\$:CM\$="" 'temporarily disable keyboard commands

LG 1040 ON TDDI GOSUB 1070,1170, 1300,1430,1560,1630

LN 1045 CM\$=SCMS 'restore keyboard commands

JK 1050 RETURN

NF 1060 'Drawing routine

FY 1070 IF PENUPT AND NOT KEYMODE THEN RETURN 'drawing only works with pen down

CH 1080 CURSOR=0 'disables cursor for faster drawing

SP 1090 WHILE MB=0 AND (NOT PENU P OR KEYMODE)

EE 1100 SX=MX:SY=MY:GOSUB 20000: MY=-MY*(MY>7 AND MY<CY)- B*(MY<0)*(CY-1)*(MY>CY)

LM 1110 LINE (SX,SY)-(MX,MY),COL R 'connect the line

FK 1120 WEND

FJ 1130 WHILE MB:GOSUB 20000:WEN D 'wait for button release

SE 1140 CURSOR=TRUE

JH 1150 RETURN

OO 1160 'Draw lines

MN 1170 SX=MX:SY=MY:CURSDR=0 'disables cursor during line drawing

NP 1180 WHILE MB=0

LL 1190 LINE (SX,SY)-(MX,MY),0 'erase previous line

OB 1200 GOSUB 20000:MY=-MY*(MY>7 AND MY<CY)-B*(MY>B)-(C Y-1)*(MY>CY)

BL 1210 LINE (SX,SY)-(MX,MY),COL R 'draw new line

EA 1220 EX=MX:EY=MY

FP 1230 WEND

PO 1240 WHILE MB:GOSUB 20000:WEN D 'wait for button release

SE 1250 PUT (1,B),UNDD%,PSET 're store mangled screen

ED 1260 LINE (SX,SY)-(EX,EY),COL R 'draw final line

JH 1270 CURSOR=TRUE

JH 1280 RETURN

FL 1290 'Draw boxes

CF 1300 SX=MX:SY=MY:CURSOR=0 'disables cursor

LO 1310 WHILE MB=0

OF 1320 LINE (SX,SY)-(MX,MY),0, B 'erase previous box

PB 1330 GOSUB 20000:MY=-MY*(MY>7 AND MY<CY)-B*(MY>B)-(C Y-1)*(MY>CY)

KO 1340 LINE (SX,SY)-(MX,MY),COL R,B 'draw new box

FL 1350 EX=MX:EY=MY

BK 1360 WEND

NJ 1370 WHILE MB:GOSUB 20000:WEN D 'wait for button release

SE 1380 PUT (1,B),UNDD%,PSET 're store mangled screen

LA 1390 LINE (SX,SY)-(EX,EY),COL R,B 'draw final line

HM 1400 CURSOR=TRUE

IG 1410 RETURN

OB 1420 'Draw circles

DA 1430 SX=MX:SY=MY:CURSOR=0 'disables cursor

MJ 1440 WHILE MB=0

PM 1450 CIRCLE (SX,SY),SQR(ABS(SX-SX)^2+ABS(SY-MY)^2),0

QM 1460 GOSUB 20000:MY=-MY*(MY>7 AND MY<CY)-B*(MY>B)-(C Y-1)*(MY>CY)

NP 1470 CIRCLE (SX,SY),SQR(ABS(SX-SX)^2+ABS(SY-MY)^2),COL R

FG 1480 EX=MX:EY=MY

GF 1490 WEND

PI 1500 WHILE MB:GOSUB 20000:WEN D 'wait for button release

SE 1510 GOSUB 3000:PUT (1,B),UNDO%,PSET 'restore mangled screen

JH 1520 CIRCLE (SX,SY),SQR(ABS(S X-EX)^2+ABS(SY-EY)^2),COL R

CL 1530 CURSOR=TRUE:GOSUB 12000: GOSUB 6000 'redraw screen

n bar and color bars in case circle overwrote it

JB 1540 RETURN

OK 1550 'Spraycan

BB 1560 WHILE MB=0 AND (NOT PENU P OR KEYMODE)

JE 1570 GOSUB 20000:IF MY<12 OR MY>CY-5 THEN 1590

BB 1580 GOSUB 19000:PSET (MX+4-8*RND,MY+4-8*RND),CDLR

GH 1590 WEND

OJ 1600 WHILE MB:GOSUB 20000:WEN D

JG 1610 RETURN

LO 1620 'Paint

NA 1630 ON ERROR GOTO 1660:PAINT (NX,MY),CDLR:LINE (0,0)-(XRES-1,YRES-1),B:GOSU B 6000:GOSUB 12000

FA 1640 DN ERROR GOTO 0:WHILE MB :GOSUB 20000:WEND 'release

SE 1650 RETURN

KA 1660 RESUME NEXT

ED 1670 'Menu handler:

OF 2000 ON MNID GOSUB 2030,2320, 2380 'Picture, Tools, Screen

IP 2010 RETURN

OO 2020 'File menu

FC 2030 ON MNIT GOSUB 2060,2080, 2100,2170,2240,2300 'Und o,New,Open,Save,View,Dui t

JL 2040 RETURN

JG 2050 'Undo:

AF 2060 GOSUB 19000:PUT (1,B),UNDO%,PSET:RETURN

EO 2070 'New:

HE 2080 GOSUB 3000:RETURN

IH 2090 'Open:

NB 2100 TYP\$="OPEN":GOSUB 4000 'get filename

OJ 2110 IF FILENAME\$="" THEN 213 0

NC 2120 DN ERROR GOTO 5500:DEF S EG=SEGADR:BLOAD FILENAME \$,0

JU 2130 ON ERROR GOTO 0:CLOSE#1

ED 2140 LINE (0,0)-(XRES-1,YRES-1),B:GOSUB 12000:EDSUB 6000

JN 2150 RETURN

GD 2160 'Save:

MK 2170 TYP\$="SAVE":GOSUB 4000 'get filename

NA 2180 IF FILENAME\$="" THEN 221 0

FN 2190 GET (1,B)-(XRES-2,CY-1), UNDO%:CLS:PUT (1,B),UNDO%,PSET

OL 2200 ON ERROR GOTO 5500:DEF S EG=SEGADR:BSAVE FILENAME \$,0,SCRLEN!

KP 2210 ON ERROR GOTO 0:CLOSE#1: GOSUB 3000:PUT (1,B),UND O%,PSET

JG 2220 RETURN

NM 2230 'View:

DF 2240 GOSUB 19000:CURSOR=0

EO 2250 GET (1,B)-(XRES-2,CY-1), UNDO%:CLS:PUT (1,B),UNDO%,PSET

HB 2260 WHILE MB=0:GOSUB 20000:W END

OG 2270 WHILE MB:GOSUB 20000:WEN D

MF 2280 GOSUB 3000:PUT (1,B),UND O%,PSET:CURSOR=-1:RETURN

KO 2290 'Quit

CH 2300 SCREEN 0,0,0:END 'use SYSTEM to exit to DOS

KK 2310 'Tools menu

```

f2 2320 MFLAGS(MNID,TDDL)=1 'turn off previous tool
KC 2330 MFLAGS(MNID,MNIT)=2:TDDL=MNIT 'turn on current tool
J0 2340 RETURN
HE 2350 STDP 'protect subroutine from accidental execution
IE 2360 '
FJ 2370 'Screen:
KA 2380 IF MNIT<4 THEN SMDE=MNI T-2:(MNIT=3):GDSUB 3000
PK 2390 IF MNIT=4 THEN CDLDR=1: MFLAGS(MNID,4)=2:MFLAGS(MNID,5)=1
BM 2400 IF MNIT=5 THEN CDLDR=2: MFLAGS(MNID,4)=1:MFLAGS(MNID,5)=2
IF 2410 IF MNIT=6 THEN BG=(BG+1) AND 15:IF SMODE=1 THEN COLOR BG ELSE COLOR ,BG
BF 2420 IF MNIT=7 THEN FRDZEN=MDFLAGS(MNID,MNI T)=1-FRDZEN
DE 2430 IF MNIT>8 THEN RETURN
GA 2440 GOSUB 19000:LOCATE 1,1:MSG1=LEFT$( "Move stick to upper left, press button." )+SPACE$(80),SWIDTH$:G OSUB 13000
HJ 2450 WHILE STRIG(1)=0:XOFF=STICK(0):WEN D
NJ 2460 WHILE STRIG(1)<>WEND 'wait for release
FO 2470 LOCATE 1,1:MSG1=LEFT$( "Move stick to lower right, press button." )+SPACE$(80),SWIDTH$:GDSUB 13000
HK 2480 WHILE STRIG(1)=0:XMAX=STICK(0):YMAX=STICK(1):WEN D
NC 2490 WHILE STRIG(1)<>WEND 'wait for release
DH 2500 XRATE1#=XRES/XMAX:YRATIO #=YRES/YMAX
IF 2510 GOSUB 12000:RETURN
KA 2520 'Set up a screen, given XRES,YRES,PCJRMODE
NB 3000 GOSUB 19000 'turn off cursor
KD 3010 IF SMODE=PMODE THEN 3030
KD 3020 ON SMDE:GOSUB 3110,3150 ,3030,3030,3190
CP 3030 PNODE=SMDE
ND 3040 SWIDTH=INT(XRES/B):XRATE1#=XRES/XMAX:YRATIO #=YRES/YMAX 'screen width
PE 3050 CLS:PSET (10,10):DRAW "b m10,10d3e313f":GET (10,10),(17,17),ARROW% 'create cursor
ME 3060 XARRDW=B:YARRDW=B 'horizontal and vertical size of cursor
JD 3070 CLSLINE (0,0)-(XRES-1,Y RES-1),B 'border
PC 3080 GDSUB 6000:GOSUB 12000
KI 3090 RETURN
HJ 3100 '
DD 3110 SCREEN 1:CDLDR 0,1:CDLDR=1:XRES=320:YRES=200:BG=0 :MAXCOLOR=4
HA 3120 GDSUB 3230:MFLAGS(3,1)=2 :SEGAOR=&HBB00:SCRLEN!=1 6384
PJ 3130 MFLAGS(3,4)=2:MFLAGS(3,S )=1:MFLAGS(3,6)=1
JL 3140 RETURN
ON 3150 SCREEN 2:XRES=640:YRES=2 00:MAXCOLOR=2:COLR=1
JS 3160 GOSUB 3230:MFLAGS(3,2)=2 :SEGADR=&HBB00:SCRLEN!=1 6384
DD 3170 MFLAGS(3,4)=0:MFLAGS(3,5 )=0:MFLAGS(3,6)=0
JH 3180 RETURN
JK 3190 SCREEN 5:XRES=320:YRES=2 00:MAXCDLDR=1:CDLDR=1
FE 3200 GDSUB 3230:MFLAGS(3,3)=2 :SEGADR=&HBB00:SCRLEN!=1 2768!
KJ 3210 MFLAGS(3,4)=0:MFLAGS(3,5 )=0:MFLAGS(3,6)=1
IH 3220 RETURN
JP 3230 MFLAGS(3,1)=1:MFLAGS(3,2 )=1:MFLAGS(3,3)=-PCJR:RE TURN 'reset modes
CH 3240 'Get a filename...
EG 4000 GOSUB 19000:GET (1,B)-(X RES-2,CY-1),UNDO% 'save screen
JG 4010 MSG1="Please enter name ":MSG2="cf picture to " +TYP$:
JP 4020 TW=SWIDTH/2-10:LINE (TW*8-10,50)-(TW*8+160,100),0,BF:LINE (TW*8-10,50)-(TW*8+160,100),8,BL1NE (TW*8-8,52)-(TW*8+158,98),8 'draw box
HO 4030 LOCATE B,SWIDTH/2-LEN(MS G1)/2:PRINT MSG1:LOCAT E 9,SWIDTH/2-LEN(MSG2)/2:PRINT MSG2:
PG 4040 LINE (TW*8+5,78)-(TW*8+1 55,89),8:LOCATE 11,TW+1 :MAXLEN=18:GDSUB 5000
IP 4050 FILENAME$=EDT$:IF FILENA ME$="" THEN IF M10$(EDT$ ,LEN(EDT$)+3)=(LEN(EDT$)>3),1)>," Then FILENAME$=FILENAME$." ,PI$=CHR$(4 8+SMODE)
PJ 4060 PUT (1,B),UNDO%,PSET 're store screen
JD 4070 RETURN
BM 4080 'Get a line of text (EDT $) of maximum length MAX LEN
QP 5000 EDT$=":1:XPDS (0):IY=CSR LIN:XI=IX:K80=-1:IF MAX LEN=0 THEN MAXLEN=79-IX
SB 5010 WHILE KBD<>13
SE 5020 WHILE KBD>>13
XI=LEN(EDT$)+1:XL=LOCATE IY,IX:PRINT "-":KBD$=IN PUT$(1)
PF 5030 KBD=ASC(KBD$):LDCATE 1 Y ,XI:PRINT " ";
DC 5040 IF KBD=8 AND LEN(EDT$)>0 THEN EDT$=LEFT$(EDT$,L EN(EDT$)-1)
KH 5050 IF LEN(EDT$)<MAXLEN AND (KBD AND 127)>=32 THEN EDT$=EDT$+KBD$:LDCATE 1 Y ,XI:PRINT KBD$;
SI 5060 WEND
JE 5070 RETURN
SB 5080 'Error trap:
HJ 5090 CLDSE #1 'close any file
FE 5110 GDSUB 19000:GET (1,B)-(X RES-2,CY-1),UNDO% 'save screen
KK 5520 TW=SWIDTH/2-10:LINE (TW*8-10,50)-(TW*8+160,100),0,BF:LINE (TW*8-10,50)-(TW*8+160,100),8,BL1NE (TW*8-8,52)-(TW*8+158,98),8 'draw box
PK 5530 IF ERR>=82 THEN MSG1$="D DS ERRDR #"+STR$(ERR):EL SE MSG1$="ERRDR #"+STR$(ERR):" in line"+STR$(ERL )
JF 5540 MSG2$=(R)etry or (C)anc

```

JN 9310 DATA 3,6,1," 8kgd color B"
 ED 9320 DATA 3,7,1," Keyboard K"
 IB 9330 DATA 3,8,1," Calibrate J"
 DD 9340 DATA ,,,X
 HM 10000 "Menu package runs from lines 10000-29999
 NC 10010 "Graphics adaptor required (works with a wide variety of modes)
 FW 10020 "This entry point is for defining an individual menu entry
 DM 10030 '(equivalent to MENU me nuid,menutime,flag,menu string\$ in Mac/Amiga BA SIC)
 HF 10040 "Pass variables MNID,MN IT,MFLAGS, and MNAMES\$
 NH 10050 "MNID=which menu
 JH 10060 "MNIT=which item (or 0 to define menu title)
 PS 10070 "MFLAGS=0 (ghosted), 1 (normal), 2 (checked)
 DE 10080 "MNSTRS=name of menu or menu item
 FN 10090 "You can also fill the MENUTITLE(), MITEMS(), MITEMS() arrays direct Iy. Set Topid to # of last menu, and call MEN U_REFRESH to update other arrays
 FC 10100 "include the DIM statements following the MENU entry point
 ID 10110 "If you don't set the variable SWIDTH (screen width) to 40 or 80, it defaults to 80
 LN 10120 "
 LH 10130 "*** MENU ***
 LF 10140 "
 HK 11000 MAXMENUS=8:MAXITEMS=8, maximum # of menus and menu items
 SF 11010 IF NOT MENUINIT THEN DIM MTITLE\$(MAXMENUS,MAXITEMS),MFLAGS(MAXMENUS,MAXITEMS),MITEMS(MAXMENUS\$),MSAVE%(\$00#ITEMS+\$0),MX(MAXMENUS):TOPID=0 :MENUINIT=-1
 JE 11020 IF MNID<1 OR MNID>MAXMENUS OR MNIT<0 OR MNIT>MAXITEMS THEN PRINT "Illegal MENU PARAMETERS":STOP
 IH 11030 MTITLE\$(MNID,MNIT)=MNST RS:\$MFLAGS(MNID,MNIT)=MF LAG
 GL 11040 IF MNIT>MITEMS(MNID) THEN MITEMS(MNID)=MNIT
 BA 11050 IF MNID>TOPID THEN TOPID=MNID
 IF 11060 RETURN
 MA 11070 "
 SD 11080 "Next entry point redraws menu bar at top of screen
 NI 11090 "
 HH 11100 "*** MENU_REFRESH ***
 LL 11110 "
 NJ 12000 IF SWIDTH=0 THEN IF XSIZE THEN SWIDTH=INT(XSIZE/E/8+.5) ELSE SWIDTH=0
 DM 12010 MSG\$="" :MX(0)=8:SVX=PD S(0):SVY=CSRLIN
 SL 12020 FDR MI=1 TO TDPI:MX(MI)=MX(MI-1)+8+LEN(MTITLE\$(MI,0)):MSG\$=MSG\$+"
 " :NEXT:MS G\$=MSG\$+SPACE\$(SWIDTH-L EN(MSG\$))
 KA 12030 LDLOCATE 1,1:GDSUB 13000 'print MSG\$ in reverse video
 NL 12041 "
 EF 12050 'Print MSG\$ in reverse video
 BI 13000 X1=PDS(0)*8-8:Y1=CSRLIN *8-8:PRINT MSG\$;X2=X1+LEN(MSG\$)*8-1:IF X2>=SW IDTH\$8 THEN X2=SWIDTH\$8 -1
 LL 13010 GET (X1,Y1)-(X2,Y1+7),Z2 ZTEMPZ:PUT (X1,Y1),ZZTE MP%,PRESET:RETURN
 LA 13020 "
 CL 13030 ' Following entry point checks for menu select ion
 OH 13040 'If a menu item is selected, returns MNID (menu id) and MNIT (menu item id)
 NM 13050 "
 ED 13060 '*** MENU_PDL ***
 NE 13070 "
 ND 14000 XSAVE=PDS(0):YSAVE=CSRLIN
 LP 14010 MNIT=0:MNID=0:GDSUB 200 00 'get "mouse" coordinates
 BJ 14020 IF MY>7 DR MB=0 THEN RETURN 'no menu event
 ID 14030 WHILE MB:GDSUB 20000:WE ND 'wait for button release
 EH 14040 MI=1:WHILE MI>TOPID AND NDT (MX)=MX(MI-1) AND MX<=MX(MI):MI=MI+1:WE ND
 EL 14050 IF MI>TOPID THEN RETURN 'no menu selected
 DI 14060 MNID=MI 'found which menu, but not which item
 HJ 14070 IF SNDFX THEN SDUND 100 00-.5
 FP 14080 GDSUB 16000:GDSUB 20000 'drop menu, check "mouse"
 KI 14090 SAVDACC=DACC:SAV\$=CM\$=C M\$="":IF KEYNODE THEN YM=2:NY=M:YACC=-8 'speed up keyboard temporary Iy, to make menu selection easier
 IN 14100 WHILE MX>=MX(MNID-1) AND MX>=MX(MNID) AND MB=0
 NM 14110 GDSUB 20000 'sets ms, m y,mb
 HD 14120 MI=INT(MY/8):IF MI>MITEMS(MNID) THEN GOTO 141 50
 AF 14130 IF MI=MNIT DR MFLAGS(MNID,MNIT)=0 THEN 14100
 NJ 14140 GDSUB 19000 'turn cursor off during rendering
 EC 14150 IF MNIT>0 THEN LOCATE MNIT+1, INT(MX(MNID-1)/8 +2):PRINT MTITLE\$(MNID,MNIT) 'un-reverse previous item
 DR 14160 IF MI>0 AND MI<=MITEMS(MNID) THEN MNIT=MI:LDCTE MNIT+1, INT(MX(MNID-1)/8)+2:\$MSG\$=MTITLE\$(MNID,MNIT):GDSUB 13000:IF SNDFX THEN SDUND 20000 ,1 'print MSG\$ in reverse video
 BI 14170 IF MI>MITEMS(MNID) THEN MNIT=0
 LL 14180 WEND
 KE 14190 IF MX<MX(MNID-1) DR MX> MX(MNID) THEN MNIT=0 'moved away from menu, so menu item is invalid
 SD 14200 IF MNIT THEN GDSUB 1500 0 'flash selection
 LP 14210 GDSUB 17000 'remove menu
 IA 14220 WHILE MB:GDSUB 20000:WE ND 'wait for button release
 NG 14230 'Delete next line if you want to know if a menu was selected, even if no menu item was selected.
 HG 14240 IF MNIT=0 THEN MNID=0:IF F SNDFX THEN SDUND 150, 2:SDUND 50,1 'uh-oh
 DG 14250 GDSUB 18000:DACC=SAVDAC CM\$=SAV\$:LDLOCATE YSAVE ,XSAVE 'restore main program's settings
 JB 14260 RETURN
 NH 14270 "
 CL 14280 'Flash selected menu item MNIT
 JM 15000 IF MNIT=0 DR HIGHLIGHT=0 THEN RETURN
 FM 15010 MSG\$=MTITLE\$(MNID,MNIT) :FOR MI=1 TO DR HIGHLIGHT: LOCATE MNIT+1,XP:GDSUB 13000 'reverse it
 ON 15020 IF SNDFX THEN SDUND 100 00#MI*500,,1
 HG 15030 LDLOCATE MNIT+1,XP:PRINT MSG\$ 'unreverse it
 BN 15040 NEXT:RETURN
 MR 15050 "
 CH 15060 'Drop down a menu, give n MNID. Saves background of image for when menu is restored
 HD 15070 '*** MENU_ODWN ***
 NM 15080 "
 KE 16000 WX1=MX(MNID-1):WX2=MX(MNID):WY1=8:WY2=8+\$#MITEMS(MNID):XP=INT(WX1/8)+2
 JC 16010 GDSUB 19000 'erase cursor
 CL 16020 LOCATE 1,XP-1:PRINT " "+MTITLE\$(MNID,0)
 FP 16030 GET (WX1-2,WY1)-(WX2+2, WY2+2),MSAVE% 'save menu area
 DG 16040 LINE (WX1-2,WY1-1)-(WX2+2,WY2+2),8 'draw border
 NH 16050 LINE (WX1-1,WY1)-(WX2+1, WY2+1),0,BF 'erase inside of border
 NM 16060 FDR MI=1 TD MITEMS(MNID)
 JO 16070 LDLOCATE MI+1,XP:PRINT M TITLE\$(MNID,MI)
 DL 16080 IF MFLAGS(MNID,MI)=2 T HEN PSET (WX1,MI*8+5):D RAW #fe5"
 DA 16090 IF MFLAGS(MNID,MI)=0 T HEN GET (WX1,MI*8)-(WX1 +LEN(MTITLE\$(MNID,MI)) *8+7,MI*8+7),ZTEMPZ:PUT (WX1,MI*8),ZZTE MP%
 NL 16100 NEXT MI
 IO 16110 RETURN
 NJ 16120 "
 FP 16130 '*** MENU_AWAY ***
 HB 16140 "

```

JA 17000 GOSUB 19000 'erase curs
or
BK 17010 PUT (WX1-2,WY1),MSAVE$,
PSET
AB 17020 LOCATE 1,XP-1:MSG$=" "+$T
ITLE$(MNID,0):GOSUB 1
3000
IF 17030 RETURN
MA 17040 '
KN 17050 'Cursor ON
PN 18000 IF CURSOR$=0 OR TDGGLE=1
THEN RETURN 'no cursor
, or cursor already on
HJ 18010 PUT (MX,MY),ARRDW%:TOGG
LE=1:RETURN
MJ 18020 'Cursor OFF
SE 19000 IF CURSOR$=0 DR TOGGLE=0
THEN RETURN 'no cursor
, or cursor already off
FK 19010 PUT (MX,MY),ARRDW%:TOGG
LE=0:RETURN
MM 19020 '
DP 19030 'Following routine chec
ks "mouse", returns scr
een coords MX,MY, and b
utton status MB (0 if n
ot pressed, else 1).
BA 19040 'Requires that XRA TDE
and YRATIOM set to rati
o of horizontal/vertica
1 resolution divided by
maximum value of joyst
ick. XOFF and YOFF are
the lowest values retu
rned by joystick or tab
let.
BG 19050 'XRES and YRES are the
width and height of the
screen in pixels
HN 19060 'If CURSOR flag is set
to -1, the routine upda
tes an arrow cursor.
DH 19070 'if FRDZEN flag is non
-zero, disables joystick
/tablet.
EK 19080 'Be sure to initialize
ACC=1 and DACC. ACC is
an accelerating distan
ce moved by cursor keys
, reset to DACC to stop
acceleration. If DACC
is negative, movement
is constant, with no ac
celeration.
MJ 19090 'Two flags returned are
KEYMDDE (0 if joystick
/pad was just used, els
e -1) and PENUP (0 for
no contact with pad or
joystick at far upper-l
eft corner, else -1).
LH 19100
KK 19110 *** GETXY ***
MP 19120
DN 20000 MB=0: PENUP=0
JL 20010 IF NOT FRDZEN THEN S0=S
TICK(0):S1=STICK(1):MB=
STRIG(1):IF S0<>DFF DR
S1<>YOFF THEN NX=INT((S0-XOFF)*$RATIOM):NY=IN
T((S1-YOFF)*$RATIOM):KE
YHODE=0:ELSE PENUP=-1
MK$=INKEY$:KY=0:IF MK$=
"" THEN IF TIMER>TM=
THEN ACC=ABS(DACC):TM=
TIMER+.1:GOTO 20060 ELS
E 20060
LM 20025 KY=ASC((MID$(MK$,2)+CHR$(0)):MB=MDR-(KY-B2):KEYMDDE=-1
E 20030 NW=-(INT((ACCD*(KY-75)/AC
D*(KY=77)))+(KY>71)):NY=-(NY+ACC*(KY-72)-ACC*(KY

```

```

=ACCD)))*(KY<>71)
MA 20040 IF KY=PK THEN ACC=ACC+2
*(ACCD13)*(DACC>0):PK=K
Y:ELSE ACC=ABS(DACC):PK
=KY
NC 20050 KY=ASC(MK$):IF NOT (KY>
47 AND KY<58) THEN WHER
E=INSTR(CM$,CHR$(KY+32$)
(KY>96 AND KY<123)):IF
WHERE THEN MNID=VAL(MI
D$(CM$,WHERE+1,1)):MNIT
=VAL(MID$(CM$,WHERE+2,1
)):IF MFLAGS(MNID,MNIT)
=0 THEN MNIT=0:MNID=0 E
LSE GDSUB 21010
W 20060 IF NX>MX AND NY>MY THEN
RETURN
DP 20065 XBOUND=XRES-XARROW:YBDU
ND=YRES-YARROW
EI 20070 NX=NX*(NX>0 AND NX<=XB
DUND)-XBOUND*(NX>XBUND
)-1-(NX1)
FO 20080 NY=-NY*(NY>0 AND NY<=YB
DUND)-YBOUND*(NY>YBOUND
)-1-(NY1)
PN 20090 GOSUB 19000:MX=NX:MY=NY
:GDSUB 1B000
HP 20100 RETURN
JJ 21010 XP=INT((MX(MNID-1)/B)+2:
MSG$=" "+$TITLE$(MNID,0
):GOSUB 19000
GG 21015 LOCATE 1,XP-1:PRINT MSG
$
NI 21020 IF SNDFX THEN SOUND 100
,0,.1
FL 21030 LOCATE 1,XP-1:GDSUB 130
0
:O 21040 RETURN

```

Program 2: REMover

```

CI 10 'REMover-deletes REMs from
a program
AF 20 CLS:PRINT"REMover: Deletes
REMs"
CL 30 PRINT:PRINT"Enter name of
ASCII program to edit":LIN
E INPUT ":";ASCFI LE$"
MK 40 PRINT:PRINT"Enter name of
ASCII program to create":L
INE INPUT ":";CREATE$"
OH 50 OPEN ASCFILE$ FOR INPUT AS
#1
NO 60 OPEN CREATE$ FOR OUTPUT AS
#2
PL 70 PRINT:PRINT"Level I change
s REM statements to "
FX 80 PRINT:PRINT"Level II delet
es all REM lines and remov
es REMs from end of line."
FD 90 PRINT:LINE INPUT "Level I
(1) or II (2): ";LV$=LV$VA
L(LV$):IF LV$1 OR LV$2 THE
N 90
HK 100 WHILE NOT EOF(1)
:11 LINE INPUT#1,L$:PRINT""
:12 IF L$=REM" THEN
:13 IF RP=0 THEN RP=INSTR(L$,
"")
:14 IF RP THEN L$=LEFT$(L$,R
P-1):IF LV$1 THEN L$=L$+"
"
:15 IF LV$2 AND RP=INSTR(L$,
"")+1 THEN 170
:16 PRINT#2,L$
EC 170 WEND
HP 180 CLOSE#1
IM 190 CLOSE#2
:200 PRINT:PRINT:PRINT"Finish
e."
IN 210 END

```

64 UN-CRUNCHER

Larry Dinwiddie

This convenient Commodore 64 utility "uncrunches" crowded BASIC program lines into separate, easily readable and edited lines. The utility works with either disk or tape, and although it is written in machine language, no machine language expertise is required to use it. It runs on any Commodore 64 or 128 (in 64 mode).

One common programming technique in Commodore BASIC is to "crunch" programs into compact form by combining multiple statements on a single program line. As most programmers soon learn, crunching conserves memory and helps a program run faster. In addition, programs listed in magazines and books are usually crunched to save space.

However, crunching also makes the program more difficult to read and modify. Often, modifying a crunched program involves breaking up a long line into two or more shorter lines. This can be tedious, and it increases the risk of errors.

"64 Uncruncher" automatically uncrunches an entire program for

you, making each BASIC statement a separate program line. The resulting program is much easier to modify than the original. And because each statement is a separate line, it is simpler to follow the program's logic as well.

Figures 1 and 2 illustrate a simple BASIC program before and after uncrunching. Both programs are listed with a width of 40 columns so they appear just as they would on your screen. Notice how much easier it is to read the uncrunched version and decipher its logic.

Figure 1: Crunched Program

```
10 POKE 53281,15:POKE 53268,15:POKE 646,
11 POKE 53208,15
120 POKE 646,0
130 GOSUB 58:IF INT(K/2)=K/2 THEN PRINT "
, AN EVEN NUMBER":GOTO 40
30 PRINT ", AN ODD NUMBER"
40 NEXT J:PRINT":PRINT "FINISHED":END
50 READ K:PRINT "K = " :K1:RESTORE:DATA 123
,456,789,987,654,321,123,456,789,111
```

Figure 2: Uncrunched Program

```
100 POKE 53281,15
110 POKE 53208,15
120 POKE 646,0
130 GOSUB 58:IF INT(K/2)=K/2 THEN PRINT "
, AN EVEN NUMBER":GOTO 140
140 PRINT ", AN ODD NUMBER"
150 GOSUB 220
160 IF INT(K/2)=K/2 THEN PRINT ", AN EVEN NUMBER":GOTO 180
170 PRINT ", AN ODD NUMBER"
180 INPUT K,J
190 PRINT
200 PRINT "FINISHED"
210 END
220 READ K
230 PRINT "K = " K
240 RETURN
250 DATA 123,456,789,987,654,321,123,456
,789,111
```

Using Uncruncher

Since Uncruncher is written in machine language, you must type it in using the "MLX" machine language entry program listed elsewhere in this issue. Be sure you read and understand the instructions for using MLX before you begin entering the data for Uncruncher.

When you run the MLX program, it asks you for a starting address and an ending address. Here are the addresses for Uncruncher:

Starting address: C000
Ending address: C60F

After you've typed in and saved all of the Uncruncher data, you can test it on any Commodore 64 BASIC program. Follow these steps:

1. Load Uncruncher into memory by typing LOAD "filename",8,1 for disk or LOAD "filename",1,1 for

tape. Substitute your own filename, of course.

2. Type NEW and press RETURN.
3. Load (but do not run) the BASIC program you want to uncrunch.
4. To start Uncruncher, type SYS 49152 and press RETURN. The screen clears and Uncruncher displays messages informing you of its progress. It takes three passes through the BASIC code to uncrunch the program. When the READY prompt returns, the uncrunching is complete.

You may pause Uncruncher at any time by holding down the f1 function key. Do not interrupt Uncruncher by pressing RUN/STOP-RESTORE; if you do, the program may be left in a garbled, unusable form. No real harm is done, but you'll need to reload the program and restart Uncruncher.

Uniform Line Numbers

Uncruncher begins numbering the new program at line 100 using line increments of 10 (110, 120, and so on). Each BASIC statement is a separate line, except for lines containing IF-THEN statements. Because the THEN portion of such a statement must be on the same line as IF, IF-THEN lines are left unchanged except for renumbering. For any BASIC statement that references a line number (such as GOTO, GOSUB, IF-THEN, RUN, and LIST), the line reference is also renumbered.

During the third pass, the program prints the line numbers it is replacing. If Uncruncher finds a statement that refers to a nonexistent line number, it prints this error message:

UNREFERENCED BRANCH IN NEW
LINE # xxxx

When you see this message, xxxx is replaced by the new line number where the nonexistent reference is located. To mark where the error occurred, Uncruncher replaces the meaningless line number with 63999, the highest legal line number. An unreferenced branch error indicates a logic error in the original program, so you should reload the original, correct the error, and then repeat the uncrunching process.

If uncrunching generates a

large number of unreferenced line number errors, you may find it useful to divert Uncruncher's output to a printer. To do this, make sure the printer is turned on, then enter this statement in direct mode (without a line number):

OPEN 4,4:CMD 4:SYS 49152

Now everything that would have been printed on the screen is sent to the printer instead. When Uncruncher is finished, type this statement and press RETURN:

PRINT#4:CLOSE 4

DATA statements are uncrunched in a special way. After uncrunching, each DATA line contains approximately 60 characters per line, including the line number and the keyword DATA. However, no individual DATA item will be split across two lines.

After the program has been uncrunched, you may list it, resave it, or modify it as usual. If you have a crunch utility, you may wish to crunch the program after making modifications.

Because the additional line numbers take up more memory, the uncrunched program is significantly larger than the original, leaving less memory for BASIC variables and arrays. In most cases this should not cause a problem other than slowing program execution somewhat. However, a very large BASIC program or one that requires a great deal of variable space may not run correctly in uncrunched form.

Similar problems may arise if the original program POKEs sprite shapes, custom characters, or other data into a reserved area within BASIC memory. If the uncrunched program text expands into the reserved area, the POKEs may destroy part of the program text. To be on the safe side, you may want to save the uncrunched program immediately before you try to run it.

64 Uncruncher

Please refer to the "MLX" article in this issue before entering the following listing.

```
C008:8D 8D C5 A5 74 8D 8E C5 83
C018:A5 75 8D 8F C5 A9 4C 85 5F
C018:73 A5 15 85 74 9A C5 85 14
C028:75 20 3A C5 A9 FF 91 A3 1C
C028:C9 91 A3 A5 9E A5 C5 20 8A
C030:1E AB A9 C9 A0 C5 20 1E 67
C038:AB A9 EF 8D 28 03 A9 00 71
```

C040:8D 96 C5 28 15 C5 AA 20 9C
C048:15 C5 E9 00 D0 07 C9 00 18
C050:D0 03 C4 09 C1 28 15 C5 93
C058:20 15 C5 EE 90 C5 20 15 C7
C060:C5 09 F0 D0 C9 A7 F0 7C
C068:38 C9 FB F0 2A C9 8A F0 7F
C070:38 C9 FB F0 2C C9 A4 F0 C1
C078:23 A2 00 8E 91 C5 C9 8D E1
C080:F0 2C C9 89 F0 28 C9 22 35
C088:D4 28 15 C5 C9 8F F0 43
C098:AD 22 D6 F5 F0 C7 EE 9E
C098:91 C5 DC D2 AD 91 C5 F0 C8
C0A0:BD 20 15 C5 C9 30 96 B0 F1
C0A8:93 C9 3A B0 B5 90 03 20 15 F4
C0B0:C5 20 6B A9 85 02 A9 00 B7
C0B8:85 A3 A9 C6 85 A4 00 00 87
C0C0:B1 A3 AA C8 B1 A3 E0 FF C3
C0C8:D0 09 FF F0 15 E4 14 A6
C0D0:D6 04 C5 15 F0 21 18 A5 A7
C0D8:A3 69 B4 85 A3 90 DF 0F E6
C0E8:A4 D8 DB 88 A5 14 91 A3 31
C0E8:A5 15 C8 91 A3 99 FF A2 1B
C0F0:E4 C8 91 A3 C4 D0 F4 A5 48
C0F8:02 F0 0B C9 2C F0 F0 C5 04
C100:AB AF AB 4C 61 C0 43 3E B4
C108:C9 A9 C9 A5 C5 20 1E AB 30
C110:26 3A C5 A2 00 8E 96 C5 36
C118:A9 0B B5 A3 A9 C6 85 A4 36
C120:20 15 C5 AA 28 15 C5 E0 1E
C128:00 D0 87 C9 00 D0 83 4C F2
C130:FB C1 20 15 C5 85 FB 20 D3
C138:15 C5 85 FC A2 01 98 9E
C140:C5 A0 00 B1 A3 AA C8 B1 F4
C148:3A E0 FF D8 04 C9 FF F0 1B
C150:1F E4 FB D8 04 C5 FC F0 4B
C158:0D 1B A5 A3 69 04 85 A3 61
C160:90 DF E6 A4 D0 DB C8 A5 78
C168:A5 91 A3 C8 A5 A6 91 A3 B2
C170:20 15 C5 C9 00 F0 66 C9 F8
C178:3A F0 55 C9 22 F0 8C C9 53
C180:83 F0 15 C9 B8 D0 E9 9E
C188:17 D0 E5 20 15 C5 C9 00 26
C190:F0 4B C9 22 D0 F0 8F D0 D3
C198:A0 00 8C 90 C5 28 15 C5 A5
C1A0:C8 C9 22 F0 LD C9 00 F0 4F
C1A8:34 C9 3A F0 23 C9 2C D0 78
C1B0:EC C0 32 90 E8 18 A5 A5 C2
C1B8:69 B5 A5 90 DA E6 A6 E2
C1C0:D6 20 15 C5 C8 C9 00 9C
C1C8:F0 13 C9 22 D0 F4 F0 FD EE
C1D0:A2 01 E8 90 C5 85 B2 A5 AE
C1D8:7A D0 95 F0 09 A2 91 8E 99
C1E0:90 C5 85 B2 85 A7 18 A5 8F
C1E8:55 A9 80 A5 90 82 E6 8D
C1F0:A6 A5 82 D0 83 4C 13 C1 AF
C1F4:4C 70 C1 A9 D1 A9 C5 24 4E
C200:1E AB 20 3A C5 A9 00 85 81
C208:A7 8D 96 C5 20 15 C5 AA B8
C210:20 15 C5 E0 00 D0 87 C9 CC
C218:00 D0 83 4C 67 C5 AD 24 C8
C220:C5 85 FB AD 25 C5 85 FC B8
C228:A1 B1 A5 91 FB 18 A5 69 0A F0
C230:61 91 FB 18 A5 69 0A F0
C238:85 A5 99 02 E6 A6 20 15 43
C240:C5 BD 94 C5 28 15 C5 8D 69
C248:95 C5 EE 90 C5 26 15 C5 8F
C250:C9 00 F0 B1 C9 3A F0 4D 5A
C258:C9 22 F0 39 C9 CB 29 85
C260:C9 A4 F0 28 A2 00 8E 91 58
C268:C5 C9 83 F0 49 C9 B8 FA 3A
C270:1E C9 F0 01 1A C9 A7 F0 32
C278:16 C9 8D 00 F0 15 C9 89 F9 10
C280:11 C9 BB D0 C8 E6 A7 D0 81
C288:4C 4D EC 24 F3 C2 4C 71
C290:FB C2 4C 09 C9 28 15 C5 6D
C298:C9 00 F0 86 C9 22 D0 F5 EF
C2A8:70 F0 AB 4C 65 C2 A2 01 8E 94
C2A8:90 C5 A5 A7 D0 9F A9 04 73
C2B0:20 F9 C4 4C 85 C2 A8 00 89
C2B8:8C 90 C5 20 15 C5 C8 C9 7E
C2C0:00 F0 C9 3A F0 DE C9 3E 38
C2C8:22 F0 14 C9 2C D0 EC C9 20
C2D0:32 90 E8 A9 85 2B F9 C4 AC

C2D8:A9 83 91 A8 4C 05 C2 28 EC
 C2E0:B15 C5 C8 09 F0 F0 B8 C9 1D
 C2E8:B22 D0 F4 F0 C2 EE 91 C5 7C
 C2F0:B4:4C D2 C4 91 C5 D0 03 7B
 C2F8:B4 4C D2 20 15 C5 C9 30 D5
 C300:B9 04 C9 3A 90 06 4C 50 33
 C308:B2 20 15 C5 AE 24 C5 86 10
 C310:A8 AE 25 C5 86 A9 28 6B 1F
 C318:B9 85 B2 A9 0B B5 A3 A9 1D
 C320:C6 B5 A4 A0 08 81 A3 AA C3
 C328:C8 B1 A3 E4 14 D0 04 C5 F4
 C330:15 F0 D0 18 A5 A3 69 04 34
 C338:85 A3 90 E7 E6 A4 D0 E3 4B
 C348:C8 B1 A3 AA 85 B3 C8 B1 84
 C348:A3 85 B2 E0 FF D0 21 C9 AC
 C350:F0 D0 1D A9 DA A8 05 2B 4F
 C358:1E AB AE 94 C5 AD 95 C5 CE
 C360:2B CD BD A9 0D 2D D2 FF 4C
 C368:A9 F9 85 D2 A9 FF 85 D3 63
 C370:A2 90 38 20 49 BC 28 DF D3
 C378:BD 85 F8 B4 FC AF 08 B1 C1
 C380:FB 99 C8 5C F0 03 C8 D6 D1
 C388:F6 A9 FE A0 C5 20 1E AB 76
 C399:EE 20 D8 A9 98 A0 C5 20 3F
 C398:1E AB 38 AD 24 C5 E5 A8 B1
 C3A0:85 FD A0 00 89 98 C5 C9 04
 C3A8:80 F0 83 C6 D6 F6 8C 97 6C
 C3B0:C5 C4 FD F0 25 B0 AD A5 C6
 C3B8:FD 84 FD 38 E5 FD 28 FB 04
 C3C0:83 C4 DC DA C3 38 98 E5 FC D2
 C3C8:20 6C C4 18 AD 24 C5 6D 8C
 C3D0:96 C5 SD 24 25 C5 98 03 EE 6E
 C3D8:25 C4 A0 00 AE 97 C5 B9 91
 C3E8:98 C5 91 A8 C5 CA D0 F7 ED
 C3E8:A5 02 C9 2C F0 07 C9 AB A2
 C3F0:F0 83 C4 50 C2 C4 09 C3 5D
 C3F8:A6 B8 86 FD A6 A9 86 FE 96
 C400:8D 96 C5 18 65 FD 85 FD 5C
 C408:90 02 E6 FE A5 2D 85 AB E6
 C410:85 A5 2E 85 AB 38 A5 AA E5 F6
 C418:FD 85 AC B0 02 C6 88 38 5D
 C420:A5 AB E5 FE AA A0 00 B1 9D
 C428:FD 91 A8 C8 C4 AC D0 F7 29
 C430:A8 00 E0 00 F0 0E E6 FE E6
 C438:E6 A9 B1 FD 91 A8 C8 D0 47
 C440:F9 C8 DA F2 38 A5 2D ED 63
 C448:96 C5 85 2D B0 02 C6 2E 5B
 C450:38 A5 2F ED 96 C5 85 2F 2A
 C458:02 B6 30 38 AD 24 C5 1D
 C460:ED 96 C5 8D 24 C5 B8 03 B4
 C468:CE 25 C5 60 8D 96 C5 A6 5A
 C470:2D 86 A3 86 AA 6B 2E 86 E1
 C478:A4 86 AB A6 8B 92 C5 4D
 C480:A6 A9 93 C5 38 A5 AA D7
 C488:E5 A8 85 FD B0 02 E6 A9 C4
 C490:38 A5 AB E5 A9 85 FE 38 6D
 C495:A5 B3 FD 85 A3 85 AA E4
 C4A0:88 04 C6 A4 C6 AB AD 96 7D
 C4A8:C5 A4 FD 18 65 A3 85 A5 E7
 C4B0:90 02 E6 A4 B1 AA 91 A3 29
 C4B8:88 D0 98 F1 81 AA 91 A3 96 A9
 C4C0:F0 E6 F0 13 C6 AB C6 44 88 1F
 C4C8:B1 AA 91 A3 88 D9 F9 B1 6F
 C4D0:AA 91 A3 CA DA ED AD 96 65
 C4D8:C5 18 65 2D 85 2D 92 02 CE
 C4E5:96 2E AD 96 C5 18 65 2F 11
 C4E8:85 2F 90 02 E6 38 AE 92 1B
 C4F0:C5 B6 A8 AE 93 C5 86 A9 69
 C4F8:60 A8 24 C5 86 A8 25 98
 C500:B5 86 A9 20 2C C4 A9 00 11
 C508:A8 AE 96 C5 91 A8 C8 A9 2D
 C510:F0 FF CA D0 F8 60 A5 C9 C2 F2
 C518:48 D0 FA EE 24 C5 D0 03 23
 C520:E6 EE 25 C5 AD 01 08 AE 98 16
 C528:C5 F0 0E C9 3A B0 0A C9 A3
 C530:20 80 F2 28 39 E9 30 88 E9 52
 C538:D0 60 A9 0B 85 A3 A9 C6 FE
 C540:85 A4 69 64 85 A5 A9 89 49
 C548:B5 A6 85 A7 25 B2 2D 24 84
 C550:55 C5 A5 2C 8D 25 C5 38 AD E4
 C558:24 E9 01 B0 2D 24 C5 B0 ED
 C560:83 C5 25 C5 A0 00 6B A5 D8
 C568:2F B8 31 A5 30 85 32 A9 13

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August 1986 COMPUTE!



The World Inside the Computer

Fred D'Ignazio, Associate Editor

Do-It-Yourself Movies On An Apple

Recently my ten-year-old daughter Catie asked if I'd like to help her with her school science project. Oh, boy! I thought. Here's a chance to show her how she could take advantage of a computer!

I was almost afraid to suggest that we use a computer, however. She's not quite as fanatical about the machines as I am, and she gets tired hearing how every family activity can somehow be tied to computers. So I didn't mention the word "computer" at all. Instead, I said, "Hey, Catie, how'd you like to make a movie for your science project?" This idea delighted her, so off we went.

The first step was to choose a subject. Catie chose black holes. "Okay," I said. "You have to do two things: Draw a bunch of squares like you see in the funnies in the newspaper, and draw pictures inside the squares of the black hole—how it's born, how it grows, and so on. Next, sit down and write a script for the movie. Match what you say in the script with the pictures in the squares."

Frame By Frame

Catie raced off and drew the pictures and wrote her script. When she came back, I was sitting in front of our Apple IIc. "Daddy," she said, "why are you sitting at the computer? We're supposed to be working on my movie."

"Aha!" I said. "The computer is going to help us make that movie." I introduced her to a program called *Fantavision*. *Fantavision* looks like a normal drawing program—it has a drawing window surrounded by lots of tools and menu options around the border. I showed Catie how she could draw things freehand or with rubberband lines, squares, circles, and so on. She could fill the objects with color, stretch them, rotate them, squish them, cut them, and paste

them anywhere in the window.

But this was just the beginning. When she was done creating a picture of a happy face, I showed her how she had just created one frame in a cartoon. She could use the mouse to scroll the screen and begin creating the next frame. Catie then drew a face of a kitty cat.

"And now you've got a little movie," I told her. I pointed the mouse to a menu box labeled GO, and we watched a short cartoon of the happy face changing into the face of the cat.

A whole movie from only two frames? The secret is a complex technique that animators call *tweening* (derived from *between*). *Fantavision* automatically constructed dozens of new frames from Catie's first frame and second frame, then inserted them between her frames to smooth out the transition. These new frames, called *tweens*, made the happy face in her first frame change gradually into the kitty's face of her second frame.

From Giant To Dwarf

With very little help from me, Catie sat down at the computer and learned how to use *Fantavision* in about half an hour. She copied her hand-drawn frames from her notebook onto the screen. The first frame was a picture of a normal, yellow-looking sun surrounded by stars in outer space. The next frame was of the same sun, now billions of years older, swollen to become a red giant star. The third frame showed the star shrunken into a tiny white dwarf star.

The white dwarf continued to shrink until it became a black hole. Catie drew a picture of the black hole that was straight out of Walt Disney—with swirling white clouds of cosmic gas spiraling around a dark center. Next, using the COPY, MOVE, and ROTATE

commands, she drew successive frames of the black hole rotating and gobbling up stars.

Then Catie designed a title, which turned out to be one of the most spectacular parts of the movie. By using the ZOOM command, Catie was able to create several successive frames with the words "The Black Hole" growing larger and larger. And when the movie starts, the letters in the title break up into pieces which come together to form the stars and the sun. This looks like an amazing special effect, but it was completely unintended; it was just a by-product of *Fantavision*'s tweening capabilities.

Finally, Catie and I set up the Apple in the room with the stereo cassette player. We bought a copy of the soundtrack to the movie *Jaws* and aimed a video camera at the computer screen while the hungry shark music was playing in the background. Catie read her script as the movie progressed—from the opening title to the birth and growth of the black hole. It took us several tries to synchronize the music, Catie's narration, and the *Fantavision* movie, but it was well worth it. The next day, Catie took her project to school and won a blue ribbon for her efforts.

I was really proud of her, but my biggest thrill came when she ran up to me after the judging and said, "You know, Daddy, sometimes I'm glad that our family has a computer."

Fantavision is available for \$49.95 for all Apple II-series computers with at least 64K of RAM. For more information, contact Brøderbund Software, 17 Paul Drive, San Rafael, CA 94903. ©



Speak Softly And Carry A Big RAM

Sooner or later it was inevitable that the grandiose and bizarre claims of some computer scientists would result in a critical response from someone with a radically different point of view. I just read such a response by Theodore Roszak, a history professor at California State University, Hayward. Roszak's book, *The Cult of Information* (Pantheon Books, 1986), lambastes an entire field for the excesses of a few. As a result, he is guilty of the same error as the people he criticizes—members of the artificial intelligensia who claim that computers accurately mimic human behavior and who feel we would be better off learning to think like machines.

I share his distaste for the extravagant and largely unsupported claims made by those who feel that silicon consciousness is our evolutionary destiny. What distresses me is that Roszak expresses the belief that the general acceptance of computers into our homes, schools, and workplaces is somehow damaging to our identity as human beings.

He is confusing the tool with the result and forgetting that technology is inherently neutral. Computers can be (and have been) used in inappropriate ways, as have fountain pens. How easy it is to use the wild exhortations of our field's fringe fanatics to damn an entire technology—one that most of us understand and use without feeling any loss of humanity.

Towards Holistic Thought

Rather than diminishing our human qualities, I think computers allow us to integrate our thinking—to become holistic learners who see knowledge as something more than a collection of facts stored in separately labeled boxes, each with its own content, and with little or no connection between them. The specialization of knowledge into fields was a result of an information ex-

plosion that made it impossible for one person to achieve mastery of all subjects. While this division will remain important for many experts in these fields, there is increasing evidence that it has negative consequences.

To take one example, many particle physicists are finding that advances in their field are aided by a study of Taoist philosophy. My own hobby of computational linguistics is populated by linguists, philosophers, and computer scientists, each willing to learn from the others. True knowledge is interdisciplinary. As soon as one draws a box around a topic to clarify the object of study, one risks excluding information or viewpoints that can end up being quite important.

I sometimes put on a multimedia event called *The Magic Universe of Recursion* in which I show the appearance of this mathematical concept in computer programming, music, art, literature, philosophy, and religion. My point is not to say that each of these topics is mathematical—mostly they are not. Rather, it is my purpose to show that recursion is an idea that breaks across traditional barriers of knowledge.

I am convinced that there are hundreds of general concepts that transcend the fields in which they were first used, if only we would look for them. Fortunately, one tool to aid in our search is readily at hand—the personal computer.

Enter The Computer

As a tool that lets us manipulate information and construct metaphorical worlds of our own design, the computer can help us chart a path across the boundaries of numerous disciplines in our quest for holistic education.

Most fields of endeavor are so complex and demanding that one has little time to search beyond the

walls of one subject for ideas of value from another area. As computer technology becomes easier to use, the tedious aspects of at least some parts of many fields will be relegated to machinery, thus freeing people to stand back and take in a larger view of the subject. It is hard to take a reading on the stars while you are rowing the boat.

This is why I first became interested in Logo. I saw, in Logo's turtle graphics, a tool that would let me explore the mathematics of naturally occurring patterns. I have spent years exploring everything from cracks in drying mud to the delicate patterns in ferns. The ease with which I could generate, test, and evaluate hypotheses with the aid of the computer allowed me to ask questions I would not have dared to ask otherwise.

My point is that the really exciting uses of computers are likely to come from the interdisciplinary holistic thinkers—people who sense the unity behind the major ideas of our time and place. These people tend not to be technologists, because the intense study needed to master technology leaves (we are told) little room for anything else. The people I have in mind are those whose interests span many fields—physics and poetry, art and archaeology—people who probably have degrees in the "liberal arts."

In order for such people to use computer technology effectively, computers must have speed, lots of memory, excellent software, and a transparent user interface. Computers like the Macintosh and Amiga are stepping stones in the right direction. Software for these computers is being designed to rise to the level of the way people work rather than dragging the user down to the machine's level. ©



The Beginners Page

Tom R. Halfhill, Editor

Advanced String Features

To wrap up our long-running series on character strings in BASIC, let's take a look at some advanced string features which are finding their way into the latest and most sophisticated versions of the BASIC language. Although these features may not be found in the BASIC you're working with now, you'll probably encounter them sometime in the future.

If you want to keep up with these trends, pay attention to any new version of BASIC released by Microsoft, Inc. Microsoft certainly isn't the only company in the BASIC business, but it definitely is the market leader. Versions of Microsoft BASIC are either standard equipment or available as an option for almost every microcomputer ever made. When an advanced feature is introduced in a new version of Microsoft BASIC, it tends to cross over into the next version which is released, even if the next version is for a completely different computer.

For instance, the latest Microsoft BASIC to appear is Amiga BASIC. It shares numerous features with its nearest predecessor, Microsoft BASIC for the Macintosh. These two dialects are so much alike that some example programs in the Macintosh BASIC manual—even those with graphics—will run unchanged on the Amiga.

Super Strings

One new trend in Microsoft BASIC is to remove the 255-character limit on strings. Macintosh BASIC and Amiga BASIC both let you define strings up to 32,767 characters long.

So what? you might say. Who needs to display a message that's thousands of characters long? It probably won't fit on the screen, anyway.

But strings are good for lots of things besides displaying messages, of course, especially if they aren't limited to 255 characters. Program-

mers on the Atari 400/800/XL/XE computers know this well, because Atari BASIC has allowed super strings since 1979.

For instance, suppose you want to write a simple terminal program for downloading public domain software from information services and bulletin boards. Unless you're handy with a memory map, you might have trouble finding a large area of free memory in your computer to temporarily hold the downloaded data before storing it on disk. With super strings, it's no problem. Simply download everything into a single string, perhaps called BUFFER\$. Since BASIC reserves and protects memory for the string, you don't have to worry about memory conflicts.

Best of all, the new Microsoft BASICs don't force you to give up anything in return for super strings—unlike Atari BASIC, which doesn't allow string arrays as a tradeoff for this feature.

Search And Replace

Another powerful feature of late-model BASICs is the INSTR function (pronounced *in-string*). INSTR searches through a longer string in search of any shorter string you specify. If INSTR finds the shorter string (*substring*), it returns a number indicating the substring's starting character position within the longer string. Example:

```
10 MAIN$="This is the longer string."
20 X=INSTR(MAIN$,"the")
```

When you run this program, INSTR returns the value 9 in the variable X, because the substring *the* begins at the ninth character position within MAIN\$. Of course, you could also use a string variable for the substring parameter in the INSTR function. If INSTR can't find the substring, it returns a 0.

By adding another parameter, INSTR can be made to begin its search at any point within MAIN\$.

For example, X=INSTR(5,MAIN\$,SUB\$) would begin searching for SUB\$ at the fifth character position of MAIN\$. The INSTR function makes it a snap to write filing programs with rapid search-and-retrieve features, because it works at nearly machine language speed.

Some recent BASICs (including Macintosh BASIC, Amiga BASIC, and BASIC 7.0 on the Commodore 128) allow the use of MID\$ as a statement as well as a function. You'll recall from the April column that the MID\$ function lets you copy a substring from within a larger string. When used as a statement, MID\$ lets you *replace* a specified substring with another string. And the replacement string isn't limited to the length of the substring it's replacing. When coupled with INSTR, the MID\$ statement makes it easy to add a search-and-replace feature to a filing program.

Finally, another useful string command found in newer BASICs is UCASE\$. This converts any string of lowercase characters to uppercase. Example:

```
PRINT UCASE$("capitalized")
```

results in CAPITALIZED. A logical application for the UCASE\$ command is to make an INSTR search routine insensitive to case. For instance, the statement X=INSTR(UCASE\$(MAIN\$),UCASE\$(SUB\$)) will make certain that INSTR will find any matching SUB\$ within MAIN\$, even if some of the characters are mixed uppercase and lowercase.

Watch for more features like these to keep appearing in new versions of BASIC. Although it's over 20 years old, BASIC is only now experiencing its greatest growth spurt as programmers continue demanding more and more power from this popular language. ©



This Fido's No Dog

In June 1984, Tom Jennings of San Francisco and John Madill of Baltimore began developing and testing an MS-DOS-based electronic bulletin board system (BBS) called Fido. Although Fido sported the usual file upload and download facilities, its electronic mail system was far from typical. Fido systems were not designed to exist as separate, isolated entities like most BBSs. Instead, Jennings and Madill set out to create a BBS that could network with others of its own kind. Rather than requiring users and system operators to call each other's BBSs to leave messages, Fido would routinely store and forward messages to other Fidos via modem in the dead of the night, when long-distance phone rates are lowest.

By August 1984 there were almost 30 Fido systems (commonly referred to as *nodes* by Fido fans). Since then, Fido has grown faster and bigger than a Saint Bernard. Today, more than 100,000 users communicate over FidoNet, which consists of more than 1,000 Fido systems spread across the U.S., Europe, and Australia. Using FidoNet, these telecomputing enthusiasts can communicate with each other overnight. And in addition to the public FidoNet, internal Fido systems are being widely used by private industry and government bureaus.

The sheer magnitude of FidoNet easily qualifies it as the largest publicly owned and operated telecomputing network in the world. Other attempts at nationwide networking via BBS have collapsed under their own administrative weight. But the organizational talents of Fido's creators and a dedicated inner core of Fido system coordinators and directors have been put to good use. Careful planning and more sweat than expended in a dozen NBA playoffs have kept the Fido network functioning

smoothly.

Global Party Line

If you live in a metropolitan area, your local Fido is likely to be a member of a group of Fido systems located relatively close to each other. Each group is considered to be a *local network*. One system within the group is designated as a *network host*. The system operator of the network host is charged with maintaining a list of the nodes in the local net.

How does Fido work? During the day, Fido users can leave messages for both local and remote users. At about 4:30 a.m., the nodes within the local network begin dialing their network host to transfer messages intended for remote Fido systems. Once all of the outgoing messages from the local net have been collected, the network host compresses them to shorten transmission time, then starts calling other network hosts to send the messages. From 5:00 to 5:30 a.m., the network hosts dial up their local nodes to deliver incoming messages. Heavily used local nets often have two network hosts, one each for outgoing and incoming traffic.

Fidos that are too isolated to be a member of a local network are called *independents* and are permitted to forward and receive mail directly to and from network hosts and other independents. Regional Fido coordinators are responsible for keeping track of independents and encouraging them to join existing nets or forming new ones.

At this writing, the U.S. is divided into 12 Fido regions. Europe has six regions; Australia, two. There are 82 network hosts worldwide. Each host has an average local net of about 13 systems. It's interesting to note that the network hosts in Europe are equipped with two different types of modems. To

handle local traffic, they use modems adhering to the CCITT (Consultative Committee on International Telephony & Telegraphy) standard, which employs different frequencies than our domestic units; U.S.-type modems handle transfers to and from Fidos in North America.

Managing The FidoNet

What's truly amazing is that the cost of operating FidoNet is very low when spread out over the entire user base. There is no centralized billing. The local nodes are at liberty to recoup the long-distance charges incurred by their network host however they see fit, either footing the bill themselves or by charging a small yearly membership fee to their local users.

The logistics of keeping things straight within FidoNet could turn into a never-ending "Who's on first?" dilemma if everyone didn't have a constantly updated "phone book," or node list, for all of the systems. Network host operators and regional coordinators are responsible for notifying the national Fido coordinators of any changes in their networks. The national coordinators, in turn, forward a compiled list of changes to Ken Kaplan, executive director of the International Fido Association. A list of FidoNet changes is automatically transmitted to the network hosts every weekend from Kaplan's Fido.

There's also an excellent weekly FidoNet newsletter, managed by FidoFiend Tom Henderson, that's both compiled and distributed via FidoNet. For more information, write to the International FidoNet Association, P.O. Box 41143, St. Louis, MO 63141. ©



INSIGHT: Atari

Bill Wilkinson

Many people have asked me to discuss the use of the DOS 2.5 RAM disk with Atari computers other than the 130XE. Most are interested either in one of the 800XL memory upgrade kits now available or in simply using the extra 16K memory of an XL as a very small RAM disk. Since I've seen the subject treated incorrectly in several user group newsletters, I decided that some mildly technical discussion here would not be amiss.

Many months ago, in one of my columns, I described the memory map of an Atari XL computer. This time, let's see how a 130XE is a fairly simple expansion of the XL models.

An Atari 130XE has 126K—not 128K—of Random Access Memory. (Keep in mind that one kilobyte equals 1,024 bytes.) The first 62K is used and accessed exactly the same way as the 62K in the 1200XL and 800XL (that 62K is not a typo, either—more on this later). Now, a 6502 microprocessor can address a total of only 64K of contiguous memory, because the address counter goes from 0 to 65535 (64 * 1024). In the hexadecimal (base 16) numbering system used by computers, those addresses are expressed as \$0000 (0) to \$FFFF (65535). When the address counter passes \$FFFF, it rolls back to \$0000 again. This is kind of like a car speedometer which only goes to 99,999.9 miles; another tenth of a mile and you have a new car again.

So, how does the 130XE access its extra 64K of memory? By a technique known as *bank selection*.

Cashing In At The Memory Bank

The extra 64K in the 130XE is divided into four separate 16K banks. The 6502 can access only one of these banks at a time. But wait, you say, if the main memory uses up the

full addressable range of the 6502, where do these extra banks fit in?

The answer: 16K of the main memory (that is, of the regular 64K) is disabled. Effectively, then, a 130XE has *five* banks of RAM, each consisting of 16K, plus another 46K (not a typo) which is *not* bank selected.

Now comes the important part: Just where, within the 64K address space of the 6502, are these five banks addressed? As Appendix H of the 130XE owner's manual states, the selectable 16K bank falls between locations 16384 (hex \$4000) and 32767 (\$7FFF). This is the second quarter of the 6502's 64K memory space. Why was this 16K area chosen instead of some other area? Because the first quarter of memory includes zero page, and bank-selecting zero page is a tricky proposition in a computer which is handling interrupts. The other two quarters of memory share space with cartridges and/or the operating system ROM, which would make programming more complicated. Thus, the second quarter of memory wins by default.

Okay so far. Now let's consider where BASIC programs reside in memory. Generally they begin at a memory location called LOMEM, which can vary but is usually between \$1C00 and \$2400 (about 7000 and 9000) when DOS is booted. BASIC programs always end below screen memory, which in turn is below the BASIC ROM. In practice, this means that BASIC programs and their variables are limited to a length of about 31K.

Let's assume that LOMEM is at \$2000 (8192). Let us also assume that we have loaded or typed in a BASIC program which is 12,000 bytes long. Where does that program end? Smack dab in the middle of the second quarter of memory, where the banks are selected.

You might think that this would cause a problem on a 130XE, since it has to switch that bank of memory on and off. But it's not a problem, because one of those five banks is assigned to be main memory—that is, the memory corresponding to the only memory at that address in 1200XL or 800XL. The DOS 2.5 RAM disk never touches that bank; it limits itself to the other four banks.

Okay, enough background on the 130XE. Is there a way to use the extra 16K memory of the 800XL as a RAM disk? Yes, but it isn't easy. That extra memory is addressed from \$C000 to \$FFFF (but see below for an exception). Aside from the fact that DOS 2.5 wasn't designed to see a RAM disk in this address range, this range is shared with the operating system ROMs and the hardware input/output area. Shared? Yep, more bank selection. And this bank is even trickier to use.

To Be Continued

Just as things start to get interesting, I run out of room. There is much more to this topic. For example, we haven't even looked for the missing 2K of RAM in the XLs and XEs, have we? And wouldn't it be nice to consider the effects of some of the add-on memory kits for the XLs? Until next month, let me tantalize you with some tidbits.

The RAM disk which emulates drive 8 (D8:) is one of the nice features of DOS 2.5. One of the not-so-nice features is that the RAM disk is *always* D8:. Many, many programs which want two disk drives assume that the second drive is D2:. Wouldn't it be nice if we could change the RAM disk's drive number? Say no more. The BASIC program listings below accomplish this for you.

Program 1, "REPLACE.BAS,"

is for use with the RAMDISK.COM program supplied with DOS 2.5. After you boot the system with DOS 2.5 and RAMDISK.COM, this program simply changes all the magic memory locations in DOS so that the RAM disk is now addressed as D2:. (Or you can change lines 190 and 260 to make the RAM disk emulate any drive from D2: to D8:.) If you use Program 1, the DOS files DUP.SYS and MEM.SAV will be on D2:, but otherwise DOS 2.5 will be unchanged.

Program 2, "MAKERAM.BAS," serves another purpose. As you've probably noticed, DUP.SYS and MEM.SAV take up a lot of room on the RAM disk. True, keeping them on the RAM disk does make DOS easier to use. However, if your program won't use DOS but could use more RAM disk space, why not leave them on D1? That's exactly what MAKERAM.BAS does. It initializes and installs the RAM disk, but copies no files to it—all 499 RAM disk sectors are available for your use. Naturally, you may choose any drive number for the RAM disk (see lines 190 and 260 again). And, although we could change this program to allow it to work *after* RAMDISK.COM has booted, it is a waste of time since this program reinitializes the RAM disk, anyway. Therefore, you should erase or rename the RAMDISK.COM file when using MAKERAM.BAS (but don't erase your only copy of RAMDISK.COM).

Finally, Program 3, "MAKERAM.SUB," simply changes Program 2 into a subroutine which you can include in your own programs. Use it anytime you want your program to initialize a blank RAM disk.

For instructions on entering these listings, please refer to "COMPUTE!'s Guide to Typing in Programs" in this issue of COMPUTE!.

Program 1: REPLACE.BAS

```
HF 100 REM
DA 110 REM ---- REPLACE BAS
-----
HH 120 REM
DC 130 REM A program to replace D8: with
CM 140 REM Dn: where n is an
BL 150 REM y drive
HL 160 REM
AI 170 IF PEEK(1802)<128 THE
N PRINT "No RamDisk i
```

```
nstalled!":STDP
HN 180 REM
CD 190 RAMDRIVENUM=2:REM Change this as desired
HG 200 REM
AE 210 PDKE 1920, RAMDRIVENUM
AM 220 PDKE 2953, RAMDRIVENUM
HK 230 PDKE 5439, 48+RAMDRIVE
NUM
HF 240 PDKE 1802, PEEK(1802)-128
LK 250 REM (for changes to line 260, see "Mapping the Atari")
DK 260 IF PEEK(1802)=1 AND R
AMDRIVENUM=2 THEN PDK
E 1802,3
FA 270 DIM INIT$(4)
HF 280 FDR I=1 TD 4:READ DAT
A
PI 290 INIT$(I)=CHR$(DATA):N
EXT I
AC 300 DATA 104, 76, 224, 7
NE 310 JUNK=USR(ADR(INIT$))
HJ 320 REM
JF 330 REM Verify it worked
HL 340 REM
JH 350 DIM DRIVE$(6)
CB 360 DRIVE$="Dn:.$."
IJ 370 DRIVE$(2,2)=CHR$(48+R
AMDRIVENUM)
HF 380 REM
KK 390 PDEN #1,6,0, DRIVE#
LB 400 TRAP 430
LB 410 GET #1,BYTE:PRINT CHR
$(BYTE);
EE 420 GOTO 410
EE 430 END
```

Program 2: MAKERAM.BAS

```
HF 100 REM
B110 REM ---- MAKERAM.BAS
----
HH 120 REM
B130 REM A program to set
up a RAM disk on
FI 140 REM Dn:, where n is a
ny drive
HL 150 REM number from 2 to
7 (or even 8)
HL 160 REM
CD 170 IF PEEK(1802)>127 THE
N PRINT "RamDisk alre
ady installed!":BTDP
HN 180 REM
CD 190 RAMDRIVENUM=2:REM Cha
nge this as desired
HB 200 REM
AE 210 PDKE 1920, RAMDRIVENUM
AM 220 PDKE 2953, RAMDRIVENUM
HK 230 PDKE 5439, 49
HF 240 REM (line 230 forces
DUP.SYS to drive 1)
LK 250 REM (for changes to line 260, see "Mapping the Atari")
DK 260 IF PEEK(1802)=1 AND R
AMDRIVENUM=2 THEN PDK
E 1802,3
FA 270 DIM INIT$(4)
HF 280 FDR I=1 TD 4:READ DAT
A
PI 290 INIT$(I)=CHR$(DATA):N
EXT I
AC 300 DATA 104, 76, 224, 7
NE 310 JUNK=USR(ADR(INIT$))
HJ 320 REM
JF 330 DIM DRIVE$(6)
CB 340 DRIVE$="Dn:.$."
IJ 350 DRIVE$(2,2)=CHR$(48+R
AMDRIVENUM)
```

```
HN 360 REM
KL 370 REM Initialize our ne
w disk
HF 380 REM
CJ 390 XID 254, #1, 0, 0, DRIVE#
HI 400 REM
FH 410 REM Verify it worked
HK 420 REM
KF 430 PDEN #1,6,0, DRIVE#
BK 440 TRAP 470
LF 450 GET #1,BYTE:PRINT CHR
$(BYTE);
SM 460 GOTO 450
HC 470 END
```

Program 3: MAKERAM.SUB

```
B0 10 GDSUB 9000:REM Your pr
ogram here
W 20 END
KH 9000 REM
KH 9010 REM ---- MAKERAM.SUB
----
KP 9020 REM
HP 9030 REM Subroutine to se
t up RAM disk
LB 9040 REM
EE 9050 IF PEEK(1802)>127 TH
EN PRINT "Disk alrea
dy installed!":STDP
CI 9060 PDKE 1920, 2
DA 9070 PDKE 2953, 2
GD 9080 PDKE 5439, 49
CL 9090 PDKE 1802, 3
FI 9100 DIM RAMDISK$(4)
PD 9110 FDR N=1 TD 4:READ X
EI 9120 RAMDISK$(N)=CHR$(X):NEXT N
DH 9130 DATA 104, 76, 224, 7
DF 9140 JUNK=USR(ADR(RAMDISK
$))
PH 9150 REM (any handy strin
g can be used instea
d of DRIVE$)
HF 9160 DIM DRIVE$(6)
CC 9170 DRIVE$="D2:.$."
FF 9180 XID 254, #1, 0, 0, DRIVE
$
```

LO 9190 RETURN

Attention Programmers

COMPUTE! magazine is currently looking for quality articles on Commodore, Atari, Apple, and IBM computers (including the Commodore Amiga and Atari ST). If you have an interesting home application, educational program, programming utility, or game, submit it to COMPUTE!, P.O. Box 5406, Greensboro, NC 27403. Or write for a copy of our "Writer's Guidelines."



IBM Personal Computing

Donald B. Trivette

WW II And KQ III

GATO is one of the most interesting games to come along for the IBM PC, PCjr, and compatibles in the last year. It's a strategy game that puts you in the captain's seat of a World War II *Gato*-class submarine. Your mission may be to rescue a downed pilot, resupply a friendly coast watcher, or sink an enemy fleet. Once you receive your orders, you must pilot your boat through enemy waters and around dangerous reefs using radar, charts, and the periscope—if you dare to risk detection.

Although *GATO* is billed as a submarine simulation, it's not a simulation like Microsoft's *Flight Simulator*. You won't actually learn to operate a sub or to navigate underwater. Nevertheless, there are ample controls—depth, speed, heading, fuel, battery, torpedo, periscope—to keep your fingers busy.

You won't master *GATO* in a few days—or even weeks. The level of difficulty is set by a program parameter: At level 0, where I play, Morse-code messages are translated into English and enemy ships leave a convenient trace on the patrol chart. (Even so, my record isn't good—I complete only half of my assigned missions.) At level 9 (for Annapolis graduates, I think), you'd better know Morse code and be able to make plots of enemy activity.

This isn't a game where you can shoot at everything in sight. Successfully completing the mission is the most important goal, and accomplishing that requires the use of strategy to survive.

GATO requires a PC with color/graphics adapter, 128K of RAM, and a color monitor, or a PCjr with a color monitor. It is produced by Spectrum HoloByte, Inc. (\$39.95).

A Peek At A Sequel

The *King's Quest* series of adventure games has one of the largest follow-

ings of any entertainment program for the IBM. Whenever I write about *King's Quest*, I get lots of letters—some of them quite unique. (One lady wanted to give her husband the gnome's name for his birthday.) Anyway, someone on the inside has slipped me a copy of the design specifications and some memos between the designer and programmers for *King's Quest III*, which Sierra On-Line is working on for release in late fall. I won't spoil your fun by revealing too many secrets, but I'll drop some hints of what's to come in this eagerly awaited sequel. These notes also provide some insight into how a major adventure game is carefully planned and executed by a whole team of designers, artists, and programmers. It's almost like storyboarding a film script.

From the designer's notes: "I'm going to try to make *KQ3* more difficult to solve...I'd like it to be able to do its own mapping, but Ken and Jeff will have to be talked into this...I would like to try to add more arcade-type action, but still retain the flavor of an adventure game." The notes also indicate that there will be a new routine to draw the screens because some players (including myself) are getting important clues by watching what is drawn last in a scene.

Included in the documentation will be the magic spell book, *Sorcery of Old*. The notes mention numerous spells, including ones to transform someone into a cat and another to brew up a storm. It also mentions an invisibility ointment made from toad spittle, and the new cast of characters: Medusa, a huge spider, bandits, pirates, and an abominable snowman who lives in the mountains and will drag you into his cave and devour you for dinner. The notes indicate that the best way to deal with the snowman

is to use a protective spell.

Here is the designer's description of Room 25: "Ocean side. Looks like north Calif. coastline. All, part, or none of the town will be in this picture, depending on how you draw it. There will be a dock or pier going out into the ocean from the town. Later on in the game, there will be a pirate ship that is tied to the dock. The pirate ship will probably be two screens long. You can get ocean water from this room for a spell...I'm not sure yet. Maybe, we will see a pirate walking around on the deck while it is tied to the dock and his mates are in the tavern. Or maybe we'll see an old man sitting outside the tavern, or maybe a woman coming out of the store or something. Just to make the town look like it is inhabited."

The notes also indicate that Room 38 (scene 38) is inside the bandit's hideout, and that a bandit will always be there to protect a bin. What the bin contains is unclear.

If my Sierra On-Line contact, known as Deep Ego, can come up with more, I'll let you know.

Here's a tip for those of you who are running Microsoft's *Flight Simulator* on the IBM PCjr. On some TV sets the colors will fade in and out. This occurs only with version 2.11 or earlier, only on the PCjr, and only with some TV sets. Nevertheless, what looks like a hardware problem is really a bug in *Flight Simulator*. If you call your Microsoft customer service number, they have a fix.



A New Operating System

Computer software continually evolves, and operating systems are no different. The operating system is the core software of your computer, responsible for managing the hardware and providing routines for other programs to draw upon. The Amiga operating system, for example, contains routines that support menus, windows, memory management, and multitasking.

Most computer operating systems are stored in Read Only Memory (ROM), a permanent, nonalterable form of memory. In contrast, most application software is provided on disk, which is loaded into Random Access Memory (RAM). When updates to the software become necessary (which is almost always the case), the publisher can simply ship new disks.

The only way to upgrade software stored on ROM, though, is to pry out the original ROM chips inside the computer and replace them with new ROMs. This usually requires dealer servicing.

RAM Emulating ROM

The Amiga uses a different technique. It contains only a small amount of ROM which loads the bulk of the operating system from the Kickstart disk into a special area of RAM called the Writeable Control Store (WCS). Once this RAM is filled, a special switch write-protects it—effectively turning the RAM into ROM as long as the computer is turned on. The WCS cannot be corrupted by an errant application program or even a system crash.

The WCS was originally intended as a stopgap measure until the operating system could be firmed up and burned into ROM chips. But soon after the computer was introduced, Amiga recognized the value of an easily upgradable operating system and decided to stick with the WCS. One upgrade has already been released: The

original version 1.0 was replaced with version 1.1 in late 1985. Version 1.1 added new features and cured legions of bugs that plagued 1.0, but it is still not perfect.

Over the past few months, Amiga has been working very hard to finish version 1.2. This upgrade was developed at first to work with the European Amiga, but includes numerous bug fixes and improvements as well. At this writing (mid-May), we have been exploring a prerelease version of 1.2, which might be available by the time you read this. Note that some features we'll describe may be changed in the final release version.

The most noticeable improvement in 1.2 is the much faster disk access due to a technique known as *caching*. A disk cache buffers disk reads so that frequently accessed areas of the disk are copied into RAM. From then on, the frequently accessed files are read from RAM rather than from the drive. It's similar to using the RAM disk, except that output is always stored on disk, not in RAM, so this technique is much safer than using a RAM disk. If the power is interrupted, you haven't lost your data.

Version 1.2 lets you choose how much memory to allocate for this disk cache—the more memory you set aside, the faster the disk access. The disk directory is also buffered, so directory-based operations such as Open requesters or an AmigaDOS DIR command work much faster. As a tradeoff, the momentary disk access that takes place when you first insert a disk lasts a little longer, since all directories and subdirectories are buffered. And, of course, there's less RAM available for applications, since the cache consumes some memory.

A Better Workbench

The Workbench is improved, too. The horizontal lines in a window's

title bar have been thickened to reduce flickering in the interlaced modes. When entering text into a text gadget, you can reposition the cursor by pointing and clicking the mouse. You can use Left Amiga-V and -B as shortcuts for the affirmative and negative choices in a two-button requester. When you drag icons, you move an actual copy of the icon rather than a crossed circle. This even works with multiple selections, and is really impressive when you are dragging dozens of icons. Opening a Workbench window is no longer an excuse for a coffee break: Icons now pop up quickly, with little disk access. Any reference to the RAM: device creates an icon for the RAM disk on the Workbench screen, especially handy for one-drive systems.

A new Preferences tool lets you select serial port parameters such as data bits, stop bits, and so on, greatly simplifying the use of a serial printer or modem. There's also a toggle switch for Workbench Interlace On/Off. When Interlace is turned on, the Workbench changes to a 400-line screen with twice the vertical resolution, giving 50 lines of text.

There is a new Notepad on the Workbench disk, enhanced with an Edit menu permitting copy/cut/paste and search-and-replace. You can set up the Notepad so it calls up only one font when loaded, then bring in the fonts later from a menu if you wish. You can select either character wrap or word-wrap, and you can intermix various fonts and styles in the same note. Scroll bars let you move quickly through your text. The Notepad is now almost a complete word processor.

All in all, the new operating system is very exciting. It almost makes the Amiga a whole different machine: faster, smoother, and more reliable than ever. ©



GEM Quirks

The Atari ST is a computer with excellent hardware, but all too often problems with its system software obscure this excellence. Admittedly, most users will never actually see these problems, since software developers work hard to circumvent them. Luckily, application programmers can make a real contribution to the users' perceptions of a machine.

For example, consider the ST's floppy disk drives. In theory they are among the fastest available for any microcomputer. And indeed, when you load a program, the speed is impressive. However, when a program starts performing file input/output using ordinary record sizes, there is so much operating system overhead to overcome that the ST performance is only fair. Creating a new file with 512-byte records is only a little more than twice as fast on an ST as it is on an Atari 400/800, XL, or XE.

Possible solution: The application program can read and write very large blocks to the disk (for example, 4K or bigger), performing the file buffering itself. Suddenly the performance is quite good again. This requires a little more work on the part of the application programmer, but the net effect is pleasing for the user.

Similarly, using a hard disk on the ST is an experience not to be forgotten. For example, compiling an average-length program with *Personal Pascal* usually takes one to two minutes using floppies. When using a hard disk, those times improve to 10 or 15 seconds. That's because the hard disk port on the ST is capable of transferring more than one megabyte per second.

But something happens as the hard disk starts filling up. Access times can double before the disk is even half full. Again, there's a solution: Partition the 20-megabyte disk

into four smaller, five-megabyte "logical" drives. And, since the ST uses subdirectories so successfully, this is usually a practical solution.

Gullible GEM

Perhaps the biggest problem with GEM (the Graphics Environment Manager) is that it is too gullible—tell it a lie and it believes you. Consider what happens on an Atari 400/800, XL, or XE when an Atari BASIC programmer uses a PRINT statement to display a message which is wider than the screen: The text wraps around to the next line.

When programming with GEM, the easiest way to display something on the screen is via an *alert box*. This is the small window which pops up to report errors and so forth. To display an alert box, a programmer simply defines a string of the proper form and makes an easy call to a GEM routine. But if the programmer errs when defining that string (for example, by entering too many characters or leaving out some special characters), *crash!* Time to hit the old reset button.

Now, granted, the proper form of that string is easy to validate before calling GEM, so a well-written application program will never reveal this particular problem to its user. However, this is symptomatic of much of GEM. Application programmers must do a lot of work to insure that GEM is given only legal values to work with. GEM does not seem to follow the *G/GO* rule (Garbage In, Garbage Out); with GEM it is more like *G/IC* (Garbage In, Crash!). So be careful if you're writing programs on the ST. Avoid crashes by double-checking all data before calling GEM routines.

The Software Explosion

To a beginner, the ST with its GEM operating system looks complex. And, truly, there is a *lot* to learn before you can write programs

which show off all the capabilities of the ST. But, despite my comments above, experienced programmers find that GEM does so much of the work for them that they can develop fairly complex programs relatively quickly. Too, the capabilities and accessibility of higher-level languages for the ST (such as C, Pascal, and Modula-2) have made programmers more productive. As a result, there is arguably more software available for the ST, *at this point in its life*, than for any previous computer at a comparable point in its life.

For instance, one year after the Macintosh was introduced, it had far fewer programs available than the ST has about one year after its introduction. Not only that, the ST programs tend to be considerably less expensive than their Macintosh counterparts.

One of the reasons so much software is appearing is that the cost of developing for an ST is relatively low. A part-time ST programmer can have a full-blown ST development system for not much over \$2,000 (including hard disk, printer, color and monochrome monitors, development software, and so forth). In the early days of the Mac, \$10,000 was more the order of the day, so development tended to be restricted to established software companies.

The flip side of this coin is that the quantity of *high-quality* software for the ST is certainly *not* greater than what was available for the Macintosh. Since most early Mac developers were major software companies, their quality standards were generally higher than that of part-time hackers.

Bottom line: Try to see a demo of any ST software you are planning to purchase. There are a lot of excellent ST programs, but there are also some turkeys. ©



Programming the TI

C. Regena

An Amortization Schedule

Interest rates have been plunging lately, and it seems like home mortgages and refinancing are very popular topics for newspaper articles. Recently I was reading a question-and-answer article in which the reader asked for a program for his home computer to print an amortization schedule for a home mortgage. The columnist suggested a particular program which was easy to use and costs only \$99. I couldn't believe someone would spend \$99 for a program that uses one or two basic computations! So, for the price of this magazine, here is such a program: "Loan Amortization."

It's certainly easy to use. Just enter the amount of money you want to borrow, omitting the dollar sign and comma (i.e., type 50000 instead of \$50,000). Next, enter the interest rate, such as 13 for 13 percent or 9.5 for nine and a half percent. Finally, enter the number of years for the loan. Most loans are for a certain number of whole years, such as 25 or 30, so this program is based on 12 monthly payments per year rather than calculating a number of months. The program then tells you what your monthly payment will be. (Of course, this figure doesn't include property taxes, insurance, or condominium fees.)

You may then choose to see the amortization schedule on the screen or print out a paper copy. If you have a printer, be sure to use the correct printer configuration in line 710, the OPEN statement. If you don't want to see the amortization schedule, you may calculate another loan or end the program.

Converting Math To BASIC

Among other things, Loan Amortization demonstrates how easy it can be to convert a mathematical formula into a BASIC program. Any ordinary formula can be con-

verted by using the + and - signs for addition and subtraction, the * sign for multiplication, / for division, and sets of parentheses where necessary to group mathematical operations.

Use PRINT and INPUT statements to prompt numbers from the user. You may want to use some IF-THEN statements to make sure the INPUT values are within reasonable limits for the formula. In Loan Amortization, all numbers entered must be positive. The amount of the loan has to be six digits or less (not counting the cents) to help limit the printing variables. The number of years is from 1 to 50.

Once your program has all the numbers it needs, calculate the formula and PRINT the answer. The computer, of course, is ideal for handling repetitive calculations, such as this amortization schedule.

Any economics book has formulas for various calculations involving money—savings accounts, sinking fund deposits, present worth factors, and so forth. In this case, to find the monthly payment I used the capital recovery factor formula:

$$I(1+I)^N/(1+I)^N-1$$

where I = interest and N = the number of payments. To make it easier to type the program without errors, I used the variable D for interest, since the letter I can be confused with the numeral 1. Then the program converts the percentage to a monthly decimal, $J=D/1200$. The factor with the exponent is used twice, so I calculated it as F in line 490. Line 500 then calculates the capital recovery factor, CRF.

How To Pause Printing

The FOR-NEXT loop in lines 800-1050 prints the amortization schedule with the monthly payment PAY. Part of the payment goes to principal (the variable PR), and part

is interest (the variable II). The balance is the original principal minus the principal part of the payment, P. Lines 1060-1200 calculate and print the last payment, which may be slightly different than the regular monthly payment because of rounding to the cent.

The printing on the screen includes only the month number, principal and interest, then balance. To pause the printing while it is scrolling, hold down any key. When you release the key, the schedule will continue. To make this work, lines 1010-1040 scan the keyboard in each loop. If a key is not pressed, the program goes to the next calculation. You may want to print different items or adjust the printing to better suit your needs.

All of the PRINT # statements send text to the printer. The variables L1, L2, and L3 are lengths used in the TAB functions to line up the columns. The variable R holds the user's choice: 1, 2, 3, or 4. If the choice is 1, the program skips all the statements that pertain to the printer.

The subroutine in lines 1250-1330 converts a number in the variable A to a string so that a number can be written in money form with two decimal places (using zeros where necessary). The numbers are rounded to the nearest cent.

If you have TI Extended BASIC or are converting this program to another version of BASIC, PRINT USING would be easier to use than this subroutine. For example, PRINT USING #####.## will round a number to two decimal places and will also right-justify numbers for printing straight columns.

Loan Amortization

```

100 REM AMORTIZATION
110 CALL CLEAR
120 PRINT "THIS PROGRAM WILL CALCULATE"
130 PRINT "A MONTHLY PAYMENT FOR A"

```

```

140 PRINT "GIVEN PRINCIPAL
BORROWED"
150 PRINT "AT A CERTAIN INT
EREST RATE."
160 PRINT ":" "ENTER AMOUNT B
ORROWED."
170 INPUT PP
180 IF PP>0 THEN 210
190 PRINT "PLEASE ENTER AMO
UNT > 0"
200 GOTO 160
210 IF PP<999999.01 THEN 25
0
220 PRINT "THIS PROGRAM IS
FOR LOANS"
230 PRINT "LESS THAN $99999
9."
240 GOTO 160
250 PRINT ":" "ENTER INTEREST
RATE IN %."
260 INPUT D
270 IF D>0 THEN 300
280 PRINT "PLEASE USE POSIT
IVE PERCENT."
290 GOTO 250
300 PRINT ":" "ENTER NUMBER O
F YEARS FOR"
310 PRINT "LOAN."
320 INPUT Y
330 IF (Y>1)+(Y<51)==-2 THE
N 370
340 PRINT "THIS PROGRAM IS
FOR LOANS"
350 PRINT "FROM 1 YEAR TO 5
0 YEARS."
360 GOTO 300
370 IF Y=INT(Y)THEN 400
380 PRINT "NO FRACTIONAL YE
ARS PLEASE."
390 GOTO 300
400 CALL CLEAR
410 PRINT "AMOUNT BORROWED:
";PP
420 PRINT :"INTEREST RATE:
";D;"PERCENT"
430 J=D/1200
440 PRINT "TIME IN YEARS: "
;Y
450 N=12*Y
460 IF D<0 THEN 490
470 CRF=1/N
480 GOTO 510
490 F=(1+J)^N
500 CRF=J/F*(F-1)
510 PRINT STR$(N); " MONTHLY
PAYMENTS"
520 A=PP*CRF
530 GOSUB 1250
540 PAY=A
550 PAY$=A$
560 PRINT "MONTHLY PAYMENT
= ";A$
570 PRINT ":" "PRINT AMORTIZA
TION?"
580 PRINT :"1 YES, ON SCREE
N"
590 PRINT "2 YES, ON PRINTE
R"
600 PRINT "3 NO, TRY ANOTHE
R LOAN"
610 PRINT "4 NO, END PROGRA
M"
620 CALL KEY(0,K,S)
630 IF (K=4)+(K=2) THEN 42
0
640 CALL CLEAR
650 R=K-48
660 ON R GOTO 670,670,110,1
340
670 A=PP
680 GOSUB 1250
690 PAY=A
700 IF R=1 THEN 750
710 OPEN #1:"RS232.BA=600"
720 PRINT #1:"AMOUNT BORROW

```

```

ED: ";A$
730 PRINT #1:"INTEREST RATE
";D;"PERCENT"
740 PRINT #1:"MONTH PA
YMENT";TAB(30); "PRINCIP
AL";TAB(50); "INTEREST";
TAB(65); "BALANCE"::
750 PRINT ":" "PAUSE PRINTIN
G, HOLD ANY KEY DOWN.
RELEASE KEY TO CONTIN
UE"::
760 PRINT "AMOUNT BORROWED:
";A$
770 PRINT "INTEREST RATE: "
;D
780 PRINT :"MONTHLY PAYMENT
= ";PAY$
790 PRINT ":" "PRINCIPAL
INTEREST":TAB(12); "B
ALANCE"::
B00 FOR M=1 TO N-1
B10 M$="";$TR$(M)
B20 M$=SEG$(M$,LEN(M$)-2,3)
B30 A=J#P
B40 GOSUB 1250
B50 II$=A$
B60 II=A
B70 L2=6-L
B80 A=PAY-II
B90 GOSUB 1250
900 PR$=A$
910 PR=A
920 L1=6-L
930 A=P-PR
940 GOSUB 1250
950 P=A
960 P$=A$
970 L3=6-L
980 PRINT M$;";PR$;TAB(1
B+L2);II$;TAB(10+L3);P$
990 IF R=1 THEN 1010
1000 PRINT #1:"";M$;TAB(11
);PAY$;TAB(31+L1);PR$;
TAB(51+L2);II$;TAB(65+
L3);P$
1010 CALL KEY(0,K,S)
1020 IF S<1 THEN 1050
1030 CALL KEY(0,K,S)
1040 IF S<0 THEN 1030
1050 NEXT M
1060 M$="";$TR$(M)
1070 M$=SEG$(M$,LEN(M$)-2,3)
1080 A=J#P
1090 GOSUB 1250
1100 II$=A$
1110 II=A
1120 L2=6-L
1130 A=II+P
1140 GOSUB 1250
1150 PAY=A
1160 PAY$=A$
1170 L1=6-L
1180 PRINT M$;";P$;TAB(1
B+L2);II$;TAB(15);"0"
1190 IF R=1 THEN 1220
1200 PRINT #1:"";M$;TAB(11
);PAY$;TAB(31+L1);P$;T
AB(51+L2);II$;TAB(68);
"0"
1210 CLOSE #1
1220 PRINT ":" "PRESS A KEY"
1230 CALL KEY(0,K,S)
1240 IF S=0 THEN 1230 ELSE
570
1250 A=INT(A*100+.5)
1260 A$=STR$(A)
1270 L=LEN(A$)
1280 IF L>2 THEN 1310
1290 A$="0";A$=A
1300 L=2
1310 A$=SEG$(A$,1,L-2)&"."&
SEG$(A$,L-1,2)
1320 A=VAL(A$)
1330 RETURN
1340 END

```

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News & Products

Penguin Software Announces Price Drop

Penguin Software has announced an across-the-board price drop for its software line. All programs in its COMPREHEND Interactive Novel series will be \$17.95 for 5 1/4-inch disks (Apple, Commodore 64, IBM) and \$19.95 for 3 1/2-inch disks (Atari ST, Macintosh, and Amiga). This line includes such titles as *Crimson Crown*, *Oo-Topos*, and *Transylvania*. Suggested retail price for *Graphics Magician* and *Complete Graphics System* will be \$39.95 (\$49.95 for Macintosh version).

Other graphics utilities, such as *Paper Graphics*, *Transitions*, and *Cat Graphics* will be priced at \$19.95. *Graphics Magician Junior* (Apple and Commodore) will be \$19.95. *Disk Repair Kit* will be \$12.95. In the Home series, *Home Data Manager* will be priced at \$24.95, and *Home Connection* (with \$15 free CompuServe time) will be \$29.95. Also, some backlog titles will be available for \$8.95.

Penguin Software, 2600 Keslinger Rd., P.O. Box 311, Geneva, IL 60134.

Circle Reader Service Number 220.

New Reading, Social Studies Software

CBS Interactive Learning has introduced *The Novel Approach: Lord of the Flies*, the first title in the Novel Approach computer software series developed by Media Basics for Apple, IBM, and Commodore eight-bit systems. Each program in the series focuses on a popular literary classic frequently studied in junior and senior high school. Designed to help students develop or maintain interest in reading and to build critical reading skills, each title in the Novel Approach can be used as a springboard for classroom discussion or independent study. Four additional Novel Approach titles are planned for release in the fall of 1986. They are *Animal Farm* by George Orwell, *A Tale of Two Cities* by Charles Dickens, *The Call of the Wild* by Jack London, and *Romeo and Juliet* by William Shakespeare.

The Novel Approach series motivates students to read by enhancing

their understanding and appreciation of literature. Each program helps students focus on character motivation, plot development, symbolism, narrative techniques, and vocabulary. Rather than replacing the reading of the book itself, the programs are meant to be used before, during, and after reading. Each includes three separate learning activities: The Discoverer, designed to pique interest before reading; The Explorer, a self-paced series of questions and answers that enhance understanding; and The Master, designed to test students' knowledge of the story after it has been read.

Built into each program in the Novel Approach series is a comprehensive reference guide, *The Book Scanner*. It provides background information on each book, a profile of the author, and an annotated bibliography of related

books. Errors are tracked, and corrections with explanations are provided.

The Novel Approach: Lord of the Flies comes with a program guide, teacher's guide, and backup disk. It is available for the Apple II series (48K RAM minimum), Commodore 64, and IBM-PC and PCjr with 128K RAM and graphics board for \$59.95.

CBS also has introduced *Continents and Countries*, a program for use within the social studies curriculum in grades 5-12. Designed by Neosoft, the program helps students build and test their knowledge of the nations and peoples of the world through self-paced learning activities. Its database covers over 140 countries and includes facts on each country's major religion, language, per capita income, land area, form of government, and population. *Continents and Countries*, available for

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the Apple II series with 48K RAM minimum, has a suggested retail price of \$49.95.

CBS Interactive Learning, One Fawcett Pl., Greenwich, CT 06836.

Circle Reader Service Number 221.

Baseball And Bridge For Apple

Random House has announced Apple II conversion of two programs. *APBA Major League Players Baseball* uses actual statistics from the 1984 or 1985 baseball season and lets users start their own leagues, draft teams from a list of 676 big-league players, or play with the actual rosters for all 26 teams from each season. The program is now available for Apple IIe and IIc with 128K, 80-column card, and two disk drives for \$59.95.

Tournament Bridge offers competition and practice for the serious bridge player. It is available for the Apple II+, IIe, and IIc for \$49.95. Random House also is developing a word processor for Apple II computers that uses a Macintosh-style user interface. A fall release is planned.

Random House, Electronic Publishing Division, 201 E. 50th St., New York, NY 10022.

Circle Reader Service Number 222.

Foreign Language Detective Game

Gessler Educational Software has announced French, Spanish, and German versions of Tom Snyder's bestselling program *Sniper Troops*. The program helps children develop their foreign language vocabularies and reasoning skills by having them take notes, draw maps, and organize information.

The object of the Spanish and German versions is for the player to determine who committed a crime in the old mansion and why. The player must question the suspects and remember each correct password and clue in order to solve the mystery. Available for the Commodore 64, the Spanish and German versions retail for \$39.95. In the French version, available for Apple II+, IIe, and IIc at \$49.95, the player's mission is to find the villain who fled with Lily the Dolphin.

Gessler Educational Software, 900 Broadway, New York, NY 10003.

Circle Reader Service Number 223.

More New Releases From The U.K.

Firebird Licensees, a British software licensing company which made a nice entry into the U.S. market with *Elite*,

recently introduced several new products.

The Pawn is a rich text-and-graphics adventure previously available for the Atari ST, but now shipping for the Commodore 64 and 128 (in native 128 mode). Set in the mythical world of Kerovnia, the game provides the player with an intricate network of plots and subplots with many objectives.

New members of the Firebird "flippy" family (disks with one program on each side) are *Battle of Britain/Battle of Midway* (Commodore 64, \$19.95), strategy/war games that break out into arcade-style games at certain points in the action; *Iwo Jima/Falklands '82* (Commodore 64, \$19.95); and *Chimera/Mercenary* (Atari 800/130, \$19.95).

Firebird Licensees, P.O. Box 49, Ramsey, NJ 07446.

Circle Reader Service Number 224.

ST, Amiga Programs

Classic Image is releasing two programs each for the Atari ST-series computers and the Commodore Amiga.

Disk Library is a tool for keeping track of files on your disks. Files, folders, and subdirectories can be categorized and cross-referenced. Lists of files and folders can be displayed on the screen or dumped to a printer. Disks can be searched by any category, and the entire library is automatically updated as new disks are added. *Disk Library* works with single- or multiple-drive systems and is available for both the ST and Amiga for \$49.95.

Diablo is an original game that combines animation with strategy. The screen is filled with mazelike tracks that disappear in sections as a ball rolls over them. The player's goal is to keep the ball rolling as long as possible without running out of track. Versions for the ST and Amiga retail for \$29.95 each. *Classic Image, S10 Rhode Island Ave., Cherry Hill, NJ 08002.*

Circle Reader Service Number 225.

Turbocharged Amiga

Computer System Associates has introduced a series of add-on circuit boards that modify a Commodore Amiga for high-speed operation using the Motorola 32-bit 68020 microprocessor.

A specially modified Turbo-Amiga runs at a CPU (central processing unit) clock speed of 14 megahertz, contains up to 2.5 megabytes of 32-bit memory, and can accept an optional Motorola 68881 math coprocessor. The 68020 modification alone increases overall performance by about 60 percent. By

adding \$12K of 32-bit memory, performance increases about 140 percent. Applications which use intensive floating-point math can run up to 40 times faster. Complete Turbo-Amiga systems start at \$4,980.

Computer System Associates, 7564 Trade St., San Diego, CA 92121.

Circle Reader Service Number 226.

ST, Amiga Golf Game

Accolade has announced that versions of its golf-simulation game will be available this summer for the Atari ST-series and Commodore Amiga computers.

Mean 18: Ultimate Golf uses 3-D animation to simulate golfing on three famous courses—Pebble Beach, St. Andrews, and Augusta National. In addition, you can construct your own courses. A bird's-eye view shows the position of your ball after each shot. Different levels of difficulty accommodate all kinds of players. The ST and Amiga versions of *Mean 18* will retail for \$49.95 each.

Accolade, 20833 Stevens Creek Blvd., Cupertino, CA 95014.

Circle Reader Service Number 227.

Recreational Software

Baudville is releasing three new home and educational programs for the Commodore 64, Atari 400/800/XL/XE, Apple II series, IBM PC and compatibles, Atari ST series, Commodore Amiga, and Apple Macintosh.

Video Vegas recreates authentic casino games such as blackjack, draw poker, keno, and slot machines. *Guitar Wizard* helps both novice and experienced musicians learn and analyze scales, chords, and tunings for all kinds of fretted string instruments. *Ted Bear's Rainy Day Games* is a three-in-one card game package for youngsters. It contains computer versions of concentration, old maid, and go fish.

All of the programs are scheduled for release this fall at prices ranging from \$29.95 to \$34.95.

Baudville, 1001 Medical Park Dr., SE, Grand Rapids, MI 49506.

Circle Reader Service Number 228.

Color Printer For Amiga, ST

Okidata has released adapters to make its Okimate 20 color thermal-transfer printer work with the Commodore Amiga and Atari ST-series computers.

The Plug 'N Print Modules for the Amiga and ST include a cable, cartridge ribbons, paper, and instructions. The Okimate 20 has a 24-element thermal printhead that reproduces more than

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100 colors, prints text at 80 characters per second in standard mode, or 40 characters per second in a near-letter-quality mode. Pages widths are 80 columns in standard mode or 132 columns in condensed mode. Other modes include expanded, boldface, italic, fine print, underlining, superscripts, and subscripts. An Okimate 20 with Plug 'N Print Module retails for \$268.

Okidata, 532 Fellowship Rd., Mt. Laurel, NJ 08054.

Circle Reader Service Number 229.

ST MIDI Software

Electronic Music Publishing House has announced new software to take advantage of the Atari ST's built-in MIDI (Musical Instrument Digital Interface) ports.

Midisplay turns an ST into a 16-channel digital player/recorder that gives you control over the music's tempo, key, and timbre. It can play prerecorded music through the computer or a MIDI-equipped synthesizer, record music from a MIDI synthesizer, and display the music on the screen as it plays. It can also play music in slow motion—as much as ten times slower without altering the pitch. Depending on available memory, up to 250,000 MIDI notes/events can be recorded, and more than 150,000 can be stored on a single-sided 3½-inch disk. *Midisplay* responds to MIDI START, MIDI STOP, and MIDI CONTINUE commands from a remote MIDI device, and it supports playback looping. Playback time is accurate to 1/1000 second.

The synthesizer section turns the ST into a velocity-sensitive, three-voice, realtime synthesizer with eight envelopes, envelope-release control, vibrato speed/depth controls, and storage/playback of up to 26 programmable sound patches.

Three prerecorded music disks will also be available: *Classics Volume I—Music of Bach, Beethoven, Chopin, Debussy, and Mozart; Classics Volume II—The Music of Amadeus Mozart; and Music of the Beatles*. Other music disks are planned for the future.

Midisplay will retail for \$49.95. It requires only an Atari ST; a MIDI-equipped synthesizer is optional.

Electronic Music Publishing House, 2210 Wilshire Blvd., Suite 488, Santa Monica, CA 90403.

Circle Reader Service Number 230.

Print Utility For Atari ST

Unison World has introduced an Atari ST version of its bestselling *PrintMaster*, a do-it-yourself print shop that allows easy creation of cards, signs, calendars, banners, and stationery. The

program includes over 100 high-resolution graphics and many predefined border designs, type fonts, styles, and layout patterns. Menu-driven operation makes the program very easy to use, even for someone with no programming or drawing skills.

Suggested retail price for the ST version is \$39.95. Other versions available include IBM-PC (\$59.95), Commodore 64 (\$34.95), and Apple II (\$39.95). Art Gallery disks with additional graphics are available at additional cost. *Unison World, 3165 Adeline St., Berkeley, CA 94703.*

Circle Reader Service Number 231.

More Stickybear Software

Weekly Reader Software has added several new products to its line of educational software featuring the familiar character Stickybear. *Stickybear Math 2* helps children practice multiplication and division (\$39.95). *Stickybear BASIC* is a gentle introduction to the BASIC programming language (\$39.95). *Stickybear Printer* is a sophisticated, easy-to-use graphic design program (\$39.95). And *Stickybear Car Builder* helps familiarize you with all the mechanics of car building by letting you design, construct, refine, and test sample automobiles (\$39.95).

Weekly Reader Family Software, 245 Long Hill Rd., Middletown, CT 06457.

Circle Reader Service Number 232.

New Casio Keyboards

Casio has introduced several new electronic keyboards. The Model MT-55 (\$149.50) is a 44-key mini-keyboard with twelve instrument sounds, twelve auto-rhythms, and auto-chording. This six-note polyphonic instrument has a real-time memory that holds 512 melody notes or can be used to store auto-chording for ease of performance. The Model MT-205 (\$199) is a 49-key stereo mini-keyboard with twelve instrument sounds. It features twelve auto-rhythms with intro, fill-in, and ending patterns. Optional DP-1 drum pads can be hooked up for manual play of the PCM drum sound sources. The unit is battery powered. The Model MT-88 (\$199) is a 49-key mini-keyboard with twelve instrument sounds, twelve auto-rhythms, and auto-chording. It allows auto-play of songs stored in ROM packs. The keyboard's Chord Guide feature teaches the user to play 3-note fingered chords easily by following lights over the keyboard.

Casio, Inc., 15 Gardner Rd., Fairfield, NJ 07006.

Circle Reader Service Number 233.

Briefly Noted

New products of all kinds were introduced at June's Consumer Electronics Show in Chicago. Here are some highlights:

- *SSI* introduced its latest tactical Civil War game, *Gettysburg: The Turning Point*, for Apple II series, Commodore 64, Atari 400/800/1200, and IBM-PC at \$59.95 each. *Strategic Simulations, 1046 N. Rengstorff Ave., Mountain View, CA 94043.*

- *Star Micronics* premiered an upgrade of the popular Gemini 10X printer, the Gemini II. It combines the best features from the earlier model with the ease-of-use found in office printers (\$329). *Star Micronics, 200 Park Ave., Suite 3510, New York, NY 10166.*

- *Keypunch Software* is distributing a line of inexpensive entertainment, educational, and productivity software for IBM, Apple, Commodore, and Atari. Prices range from \$6.99 to \$9.99. *Keypunch Software, 1221 Pioneer Bldg., St. Paul, MN 55101.*

- *Main Street Publishing* offers a similar budget line of packages previously sold by other publishers. Prices range from \$4.95 to \$9.95. *Main Street Publishing, 611 W. Travelers Trail; Burnsville, MN 55337.*

- *Mastertronic*'s latest releases include *Ninja*, *Elektraglide*, and *Video Poker*. For the Commodore 64 (\$9.99). *Mastertronic International, 731B Grove Rd., Frederick, MD 21701.*

- *BCI* introduced *Mind Over Matter*, which contains four self-help programs: "Lose Weight," "Stop Smoking," "Be Successful," and "Conquer Stress." For IBM-PC, Apple II, Commodore 64, and Atari 8-bit computers (\$9.95 each). *BCI Software, P.O. Box 730, Ringwood, NJ 07456.*

- *First Star Software* premiered *Spy vs. Spy III: Arctic Antics* for Commodore 64 and 48K Atari (\$29.95) and 64K Apple (\$34.95). *First Star Software, 18 E. 41st St., New York, NY 10017.*

- *Intellicreations* (formerly Datasoft) introduced *Crosscheck*, a combination crossword puzzle/Scrabble game for Atari 8-bit, Commodore 64, Apple II (\$29.95), and IBM-PC (\$39.95). *Intellicreations, 19808 Nordhoff Pl., Chatsworth, CA 91311.*

- *Sharedata* premiered the Home Companion series, a line of \$9.95 programs geared toward home repair and maintenance. *Sharedata, 7122 Shady Oak Rd., Eden Prairie, MN 55344.*

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CAPUTE!

Atari Sound Development System

If you've tried to use the Sound Editor (Program 1, p. 71) from this article in the July issue, you've no doubt discovered that something is missing. The last 53 lines of the program were accidentally omitted. To complete the listing, add the following lines:

```

E 2840 ? : ? : ? :PDKE 752,0
E 2850 ? :"Enter name for LD
AD file."
F 2860 ? :" or X to exit."
F 2870 ? :" (3 SPACES)(Q)(22 R)
(E")
D 2880 ? :" (3 SPACES)1Dnfil
ename. Extender!""
F 2890 ? :" (3 SPACES)1automat
ically attached!""
F 2900 ? :" (3 SPACES)(Z)(22 R)
{C}
H 2910 GOSUB 2630: IF FL$="X
" THEN RETURN
B 2920 IF PEEK(195)<>170 TH
EN 2940
M 2930 ? : ? FL$;" does not
seen to exist..." :PD
KE 752,1:PD$ITDIN 0,
20: ? "(6 SPACES)PRES
S ANY KEY":GET #1,K:
GDTD 2830
I 2940 ? "Okay, loading ";F
L$;"."
N 2950 CLDSE #2:DPEN #2,4,0
,FL$:GET #2,8YTE
D 2960 FOR X=0 TO 3: FDR Y=0
TD 1: GET #2,Z:SD(X,
Y)=Z:NEXT Y:NEXT X
B 2970 FOR X=0 TO 3: FDR Y=1
TD 35:GET #2,Z:S(X,
Y)=Z:NEXT Y:NEXT X
D 2980 BYT=BYTE
C 2990 FDR X=7 TO 0 STEP -1
:Y=INT(2^X*0.5):IF B
YT>Y THEN BYT=BYT-Y
:BIT(X)=1
F 3000 NEXT X
E 3010 RETURN
N 3020 REM INITIALIZATION
N 3030 GRAPHICS 0:POKE 82,0
:POKE 710,0:POKE 752
,1:DIM FL$(20),FL$(0,
20),BIT(7),(VD(3),STA
T(3)):PDKE 559,0
D 3040 FDR J=0 TO 7:BIT(J)=
0:NEXT J
E 3050 FDR J=0 TO 3:VD(J)=8
:STAT(J)=1:NEXT J
M 3060 OPEN #1,4,0,"K:"
JN 3070 SUND$ P0,50,10,10:FDR
D=1 TD 5:S:NEXT D:SOU
ND 0,0,0,0
W 3080 DIM SD(3,2),S(3,35),
G(15,4)
D 3090 RESTORE 3100:FOR X=0
TO 3:FOR Y=0 TO 2:R
EAD O:SD(X,Y)=O:NEXT
Y:NEXT X
E 3100 DATA 243,160,53760,1

```

```

93,160,53762,144,160
,53744,121,160,53762
# 3110 FDR X=0 TO 3: FDR Y=1
TD 35:S(X,Y)=0:NEXT
Y:NEXT X
# 3120 SDUND 0,100,10,10:FO
R D=1 TD 5:NEXT D:SD
UND 0,0,0,0
# 3130 RESTRDRE 31500:FDR X=1
TD 15:FOR Y=1 TO 4:
READ D:G(X,Y)=D:NEXT
Y:NEXT X
# 3140 SDUND 0,150,10,10:FO
R D=1 TO 5:NEXT D:SD
UND 0,0,0,0
# 3150 DATA 1,1,1,1,1,1,1,1,1,
1,1,0,1,1,1,0,1,1,0
,1,1,1,0,1,0,1,0,0,1
,0,1,1,1,0,1,1,1,0,1
,0,1,0,0,1,1,1,0,0,0
,0,1,0,0
JK 3160 DATA 0,0,1,1,0,0,0,0,1
N 3170 GRAPHICS 0:PDKE 710,
0:PDKE 709,10:PDKE 7
52,1:PDKE 559,0
# 3180 DL=PEEK(560)+256*PEEK
(K(561)
OP 3190 MEMTDP=PEEK(742)
# 3200 SCREEN1=PEEK(89):SCR
EEN2=MEMTDP-5
# 3210 PDKE 89,SCREEN2+PDKE
106,SCREEN2+4:POKE
DL+5,SCREEN2+1? CHR$(1
25)
# 3220 FDR D=5 TD 20:POSITI
DN 3,D1? "|||||||||||||||||"
|||||||||||||||||||||"
|||||":NEXT D
# 3230 SOUND 0,200,10,10:FO
R D=1 TD 5:NEXT D:SD
UND 0,0,0,0
# 3240 PDSITIDN 1,0:? "ENVE
LOPE EDITOR"
# 3250 PDSITIDN 2,1:? "for
Voice #"
# 3260 PDSITIDN 2,2:? "Pic
h value: "
# 3270 FDR N=15 TD 10 STEP
-1:Y=20-N:X=0:POSITI
DN X,Y? N:NEXT N
# 3280 FDR N=9 TO 0 STEP -1
:Y=20-N:X=0:PDSITIDN
X,Y? N:NEXT N
# 3290 PDSITIDN 3,22:? "123
45678901234567890123
456789012345"
# 3300 POSITION 20,0:? "E-
Listen"
# 3310 PDSITIDN 20,1:? "E-
Menu"
# 3320 PDSITIDN 20,2:? "E-
Change Sound"
# 3330 POSITIONIDN 20,3:? "E-
Clear Bars"
# 3340 SOUND 0,255,10,10:FO
R D=1 TO 5:NEXT D:SD
UND 0,0,0,0
# 3350 PDKE 89,SCREEN1:PDKE
106,SCREEN1+4:POKE
DL+5,SCREEN1+1? CHR$(0
125):POKE 559,34
# 3360 GOTO 40

```

Minding IBM Memory

The correction in last month's COMPUTE! column is not sufficient to correct all the bugs in the deallocation routine for this article from the June issue (p. 85). The `mov bx, [bp+6]` instructions in Program 2 should instead be `mov bx,[bp+8]`. To make this correction in Program 3, replace lines 100-110 with the following:

```
AH 100 DATA &h55,&h06,&h8b,&hec,  
&h8b,&h5e,&h08,&h8e,&h07,  
&h84,&h49,&hcd  
KF 110 DATA &h21,&h8b,&h5e,&h08,  
&h89,&h07,&h07,&h5d,&hca,  
&h02,&h00
```

The version of the program which appears on the COMPUTE! Disk for April-June includes all corrections.

Hex War For Amiga

The Amiga version (Program 7, p. 55) of this game in the July issue uses the lowercase letter *l* as a variable name in several places. Unfortunately, on the printer used to make the listing there is no distinction between *l* and the numeral 1, so it's difficult to tell when to use the letter and when to use the number. Here are the places where the character should be an *l* (for clarity, change these to uppercase *L*): In the lines following the ones with labels 710, 715, and 718, the expressions should be $L = cit(j,1)$, $x = (k - L) * 2 + 19$, and $y = (12 - (k + L)) * 2 + 3$. Following the DATA statements in the Strengths routine, there is a loop that should use **FOR L=1 TO 5** and **NEXT L**. In the Reveille routine, there is a loop that should use **FOR L=0 to 6, army(k,L,pn) = army(k+1,L,pn), army(k+1,L,pn) = 0**, and **NEXT L**. In the Prisoners subroutine there is a loop that should use **FOR L=0 TO 6 and army(k,L,j) = 0**. The lines labeled 3480 and 3490 should both start with *L* =, and just below those are two other statements that should read **IF c(1) => L THEN and IF c(2) => L THEN**. ©

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Thoroughbred, harness and greyhound programs are sold separately. **IBM/Compatible** and **Apple II** versions are \$49.95 each, any two for \$74.95, all three \$99.95. **Commodore 64/128** and **Tandy Color Computer** versions are \$39.95 each on tape or disk. Any two for \$59.95, all three \$79.95.

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COMPUTE!'s Guide To Typing In Programs

Computers are precise—type the program *exactly* as listed, including necessary punctuation and symbols, except for special characters noted below. We have provided a special listing convention as well as a program to check your typing—"The Automatic Proofreader."

Programs for the IBM, TI-99/4A, and Atari ST models should be typed exactly as listed; no special characters are used. Programs for Commodore, Apple, and Atari 400/800/XL/XE computers may contain some hard-to-read special characters, so we have a listing system that indicates these control characters. You will find these Commodore and Atari characters in curly braces; *do not type the braces*. For example, {CLEAR} or {CLR} instructs you to insert the symbol which clears the screen on the Atari or Commodore machines. A complete list of these symbols is shown in the tables below. For Commodore, Apple, and Atari, a single symbol by itself within curly braces is usually a control key or graphics key. If you see {A}, hold down the CONTROL key and press A. This will produce a reverse video character on the Commodore (in quote mode), a graphics character on the Atari, and an invisible control character on the Apple.

Graphics characters entered with the Commodore logo key are enclosed in a special bracket: {<A>}. In this case, you would hold down the Commodore logo key as you type A. Our Commodore listings are in uppercase, so shifted symbols are underlined. A graphics heart symbol (SHIFT-S) would be listed as S. One exception is {SHIFT-SPACE}. When you see this, hold down SHIFT and press the space bar. If a number precedes a symbol, such as {5 RIGHT}, {6 S}, or {<8 Q>}, you would enter five cursor rights, six shifted S's, or eight Commodore-Q's. On the Atari, inverse characters (white on black) should be entered with the inverse video

Atari 400/800/XL/XE

When you see	Type	See
{CLEAR}	ESC SHIFT <	Clear Screen
{UP}	ESC CTRL -	Cursor Up
{DOWN}	ESC CTRL =	Cursor Down
{LEFT}	ESC CTRL +	Cursor Left
{RIGHT}	ESC CTRL *	Cursor Right
{BACK S}	ESC DELETE	Backspace
{DELETE}	ESC CTRL DELETE	Delete character
{INSERT}	ESC CTRL INSERT	Insert character
{DEL LINE}	ESC SHIFT DELETE	Delete line
{INS LINE}	ESC SHIFT INSERT	Insert line
{TAB}	ESC TAB	TAB key
{CLR TAB}	ESC CTRL TAB	Clear tab
{SET TAB}	ESC SHIFT TAB	Set tab stop
{BELL}	ESC CTRL 2	Ring buzzer
{ESC}	ESC ESC	ESCAPE key

Commodore PET/CBM/VIC/64/128/16/+4

When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	█	{1}	COMMODORE	1
{HOME}	CLR/HOME	5	{2}	COMMODORE	2
{UP}	SHIFT ↑ CRSR ↓	●	{3}	COMMODORE	3
{DOWN}	↑ CRSR ↓	Q	{4}	COMMODORE	4
{LEFT}	SHIFT ← CRSR →	⋮	{5}	COMMODORE	5
{RIGHT}	← CRSR →	I	{6}	COMMODORE	6
{RVS}	CTRL 9	R	{7}	COMMODORE	7
{OFF}	CTRL 0	█	{8}	COMMODORE	8
{BLK}	CTRL 1	█	{F1}	█	█
{WHT}	CTRL 2	E	{F2}	SHIFT	█
{RED}	CTRL 3	±	{F3}	█	█
{CYN}	CTRL 4	█	{F4}	SHIFT	█
{PUR}	CTRL 5	█	{F5}	█	█
{GRN}	CTRL 6	↑	{F6}	SHIFT	█
{BLU}	CTRL 7	←	{F7}	█	█
{YEL}	CTRL 8	█	{F8}	SHIFT	█
			4		█

key (Atari logo key on 400/800 models).

Whenever more than two spaces appear in a row, they are listed in a special format. For example, {6 SPACES} means press the space bar six times. Our Commodore listings never leave a single space at the end of a line, instead moving it to the next printed line as {SPACE}.

Amiga program listings contain only one special character, the left arrow (-) symbol. This character marks the end of each program line. Whenever you see a left arrow, press RETURN or move the cursor off the line to enter that line into memory. Don't try to type in the left arrow symbol; it's there only as a marker to indicate where each program line ends.

The Automatic Proofreader

Type in the appropriate program listed below, then save it for future use. The Commodore Proofreader works on the Commodore 128, 64, Plus/4, 16, and VIC-20. Don't omit any lines, even if they contain unfamiliar commands or you think they don't apply to your computer. When you run the program, it installs a machine language program in memory and erases its BASIC portion automatically (so be sure to save several copies before running the program for the first time). If you're using a Commodore 128, Plus/4 or 16, do not use any GRAPHIC commands while the Proofreader is active. You should disable the Commodore Proofreader before running any other program. To do this, either turn the computer off and on or enter SYS 64738 (for the 64), SYS 65341 (128), SYS 64802 (VIC-20), or SYS 65526 (Plus/4 or 16). To reenable the Proofreader, reload the program and run it as usual. Unlike the original VIC/64 Proofreader, this version works the same with disk or tape.

On the Atari, run the Proofreader to activate it (the Proofreader remains active in memory as a machine language program); you must then enter NEW to erase the BASIC loader. Pressing SYSTEM RESET deactivates the Atari Proofreader; enter PRINT USR(1536) to reenable it.

The Apple Proofreader erases the BASIC portion of itself after you run it, leaving only the machine language portion in memory. It works with either DOS 3.3 or ProDOS. Disable the Apple Proofreader by pressing CTRL-RESET before running another BASIC program.

The IBM Proofreader is a BASIC program that simulates the IBM BASIC line editor, letting you enter, edit, list, save, and load programs that you type. Type RUN to activate. Be sure to leave Caps Lock on, except when typing lowercase characters.

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a hexadecimal number (on the Apple) or a pair of letters (on the Commodore, Atari, or IBM) appears. The number or pair of letters is called a *checksum*.

Compare the value displayed on the screen by the Proofreader with the checksum printed in the program listing in the magazine. The checksum is given to the left of each line number. Just type in the program a line at a time (without the printed checksum), press RETURN or Enter, and compare the checksums. If they match, go on to the next line. If not, check your typing; you've made a mistake. Because of the checksum method used, do not type abbreviations, such as ? for PRINT. On the Atari and Apple Proofreaders, spaces are not counted as part of the checksum, so be sure you type the right number of spaces between quote marks. The Atari Proofreader does not check to see that you've typed the characters in the right order, so if characters are transposed, the checksum still matches the listing. The Commodore Proofreader catches transposition errors and ignores spaces unless they're enclosed in quotation marks. The IBM Proofreader detects errors in spacing and transposition.

IBM Proofreader Commands

Since the IBM Proofreader replaces the computer's normal BASIC line editor, it has to include many of the direct-mode IBM BASIC commands. The syntax is identical to IBM BASIC. Commands simulated are LIST, LLIST, NEW, FILES, SAVE, and LOAD. When listing your program, press any key (except Ctrl-Break) to stop the listing. If you enter NEW, the Proofreader prompts you to press Y to be especially sure you mean yes.

Two new commands are BASIC and CHECK. BASIC exits the Proofreader back to IBM BASIC, leaving the Proofreader in memory. CHECK works just like LIST, but shows the checksums along with the listing. After you have typed in a program, save it to disk. Then exit the Proofreader with the BASIC command, and load the program as usual (this replaces the Proofreader in memory). You can now run the program, but you may want to re-save it to disk. This will shorten it on disk and make it load faster, but it can no longer be edited with the Proofreader. If you want to convert an existing BASIC program to Proofreader format, save it to disk with SAVE "filename",A.

Program 1: Atari Proofreader

By Charles Brannon, Program Editor

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:READ A:POKE I,A:CK=CK+A:NEXT I
120 IF CK<>19072 THEN ? "Error in DATA Statement
s. Check Typing.":END

130 A=USR(1536)
140 ? :"Automatic Proofreader Now Activated."
150 END
160 DATA 104,160,0,185,26,3,201,67,240,7
170 DATA 200,200,192,34,208,243,96,200,169,74
180 DATA 153,26,3,200,169,6,153,26,3,162
190 DATA 0,189,0,228,157,7,4,6,232,224,16
200 DATA 208,245,169,93,14,1,78,6,169,6,141
210 DATA 79,6,24,173,4,228,105,1,141,95
220 DATA 6,173,5,228,185,0,141,96,6,169
230 DATA 0,133,203,96,247,238,125,241,93,6
240 DATA 244,241,115,241,124,241,76,205,238
250 DATA 0,0,0,0,0,32,62,246,8,201
260 DATA 155,240,13,201,32,249,7,72,24,101
270 DATA 203,133,203,104,4,0,96,72,152,72,138
280 DATA 72,160,0,169,128,145,88,200,192,40
290 DATA 208,249,165,203,7,4,74,74,24,105
300 DATA 161,160,0,3,145,88,165,203,41,15,24
310 DATA 105,161,200,145,8,169,0,133,203,104,4,0,96
320 DATA 170,104,168,104,4,0,96
```

Program 2: IBM Proofreader

By Charles Brannon, Program Editor

```
100 'Automatic Proofreader Version 3.0 (Lines 205,206 added/190 deleted/470,490 changed from V2.0)
100 DIM L$(500),LNUM(500):COLOR 0,7,7:KEY OFF:CLS:MAX=0:LNUM(0)=65536
110 ON ERROR GOTO 120:KEY 15,C:HR$(4)+CHR$(70):ON KEY(15):GOSUB 640:KEY (15):ON:GOT0 0 130
120 RESUME 130
130 DEF SEG=&H40:W=POKE (&H40)
140 ON ERROR GOTO 650:PRINT:PR INT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-INT(LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,301:POKE 1052,341:POKE 1054,0:POKE 1055,79:POKE 1056,13:POKE 1057,28:LINE INPUT L$:DEF SEG:IF L$="" THEN 150
170 IF LEFT$(L$,1)=" " THEN L$=MID$(L$,2):GOTO 170
```

```

100 IF VAL(LEFT$(L$,2))=0 AND
MID$(L$,3,1)=" " THEN L$=M
101 L$=L$,4)
200 IF ASC(L$)>57 THEN 260 'no
line number, therefore co
mmand
205 BL=INSTR(L$," "):IF BL=0 T
HEN BL$=L$:GOTO 206 ELSE B
L$=LEFT$(L$,BL-1)
206 LNUM=VAL(BL$):TEXT$=MID$(L
$,LEN(STR$(LNUM))+1)
210 IF TEXT$="" THEN GOSUB 540
:IF LNUM=LNUM(P) THEN GOSUB
B 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$)
:CKSUM=(CKSUM+A(MID$(L$,
I)))*10 AND 255:NEXT:LOCATE
Y,1:PRINT CHR$(65+CKSUM/1
6)+CHR$(65+(CKSUM AND 15))
+" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM
THEN L$=P:TEXT$=GOTO 150
'replace line
240 GOSUB 580:GOTO 150 'insert
the line
260 TEXT$="":FOR I=1 TO LEN(L$)
:IF ASC(MID$(L$,I))=TEXT$=
TEXT$+CHR$(A+32*(A96 AND
A123)):NEXT
270 DELIMITER=INSTR(TEXT$," ")
:COMMAND$=TEXT$:ARGS$="":IF
DELIMITER THEN COMMAND$=L
EFT$(TEXT$,DELIMITER-1):AR
GS$=MID$(TEXT$,DELIMITER+1)
ELSE DELIMITER=INSTR(TEXT
$,CHR$(34)):IF DELIMITER T
HEN COMMAND$=LEFT$(TEXT$,D
ELIMITER-1):ARGS$=MID$(TEXT
$,DELIMITER)
280 IF COMMAND$<>"LIST" THEN 4
10
290 OPEN "scrn:" FOR OUTPUT AS
#1
300 IF ARGS$="" THEN FIRST$=0:P=
MAX$=1:GOTO 340
310 DELIMITER=INSTR(ARGS$,"-"):
IF DELIMITER=0 THEN LNUM=VAL
(ARGS$):GOSUB 540:FIRST$=P
:GOTO 340
320 FIRST$=VAL(LEFT$(ARGS$,DELIM
ITER)):LAST$=VAL(MID$(ARGS$,
DELIMITER+1))
330 LNUM=FIRST$:GOSUB 540:FIRST
$=P:LNUM=LAST$:GOSUB 540:IF
P=0 THEN P=MAX$-1
340 FOR X=FIRST TO P:N$=MID$(S
TR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GOT
D 370
360 CKSUM=0:A$=N$+L$(X):FOR I=
1 TO LEN(A$):CKSUM=(CKSUM+
ASC(MID$(A$,I)))*10 AND 255
:NEXT:A$=CHR$(65+CKSUM/16)
+CHR$(65+(CKSUM AND 15))+" "
370 PRINT #1,A$+N$+L$(X)
380 IF INKEY$<>" " THEN X=P
390 NEXT :CLOSE #1:CKFLAG=0
400 GOTO 130
410 IF COMMAND$="ILLIST" THEN O
PEN "lpt1:" FOR OUTPUT AS
#1:GOTO 300
420 IF COMMAND$="CHECK" THEN C
KFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN 4
50
440 GOSUB 600:OPEN ARG$ FOR OU
TPUT AS #1:ARGS$="":GOTO 30
0
450 IF COMMAND$<>"LOAD" THEN 4
90

```

```

460 GOSUB 600:OPEN ARG$ FDR IN
PUT AS #1:MAX$=0:P=0
470 WHILE NDT EOF(1):LINE INPU
T #1,L$=BL=INSTR(L$," "):B
L$=LEFT$(L$,BL-1):LNUM(P)=
VAL(BL$):L$(P)=MID$(L$,LEN
(STR$(VAL(BL$)))+1):P=P+1:
WEND
480 MAX$=CLOSE #:GOTO 130
490 IF COMMAND$="NEW" THEN INP
UT "Erase program - Are yo
u sure?":L$=IF LEFT$(L$,1)=
"Y" OR LEFT$(L$,1)="Y" THE
N MAX$=0:LNUM(0)=56536:$GDT
0 130:ELSE 130
500 IF COMMAND$="BASIC" THEN C
OLDR 7,0,0:DN ERROR GDTD 0
:CLS:END
510 IF COMMAND$<>"FILES" THEN
520
515 IF ARG$="" THEN ARG$="A:""
ELSE SEL$=1:GOSUB 600
517 FILES ARG$:GDT 130
520 PRINT "Syntax error":GDT 1
30
540 P=0:WHILE LNUM(LNUM(P)) AND
P<MAX$=P+1:WEND:RETURN
560 MAX$=MAX$-1:FDR X=P TO MAX$:
LNUM(X)=LNUM(X+1):L$(X)=L$(
X+1):NEXT:RETURN
580 MAX$=MAX$-1:FDR X=MAX TO P+1
STEP -1:LNUM(X)=LNUM(X-1)
:L$(X)=L$(X-1):NEXT:L$(P)=
TEXT$:LNUM(P)=LNUM:RETURN
600 IF LEFT$(ARG$,1)>>CHR$(34)
THEN 520 ELSE ARG$=MID$(A
RG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34)
THEN ARG$=LEFT$(ARG$,LEN(
ARG$)-1)
620 IF SEL$=0 AND INSTR(ARG$,".
")=0 THEN ARG$=ARG$+"."BAS"
630 SEL$=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT "St
opped.:RETURN 150
650 PRINT "Error #";ERR:RESUME
150

```

Program 3: Commodore Proofreader

By Philip Nelson, Assistant Editor

```

10 VEC=PEEK(772)+256*PEEK(773)
:LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
R FOR"::IF VEC=42364 THEN
[SPACE]:PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
C-20"
40 IF VEC=35158 THEN GRAPHIC C
LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
46:GRAPHIC CLR:PRINT "128"
60 SA=(PEEK(LO)+256*PEEK(HI))+6
:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
E ADR, BYT:ADR=ADR+1:CHK=CHK
+BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
ERROR* CHECK TYPING IN DATA
STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
RS=SA+RF:HF=INT(RS/256):LB=
RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
F,1:POKE SA+HF,BH:NEXT
110 IF CHK<>22954 THEN PRINT "*
ERROR* RELOAD PROGRAM AND

```

```

[SPACE]:CHECK FINAL LINE":EN
D
120 POKE SA+149,PEEK(772):POKE
SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
14,221:POKE SA+18,23:POKE SA+
29,224:POKE SA+139,224
140 PRINT CHR$(147):CHR$(17),"P
ROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
EEK(LO)+256*PEEK(HI))-1,0:N
EW
160 DATA 120,169,73,141,4,3,16
9,3,141,5,3
170 DATA 88,96,165,20,133,167,
165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
1,199,157,227,3
190 DATA 202,16,248,169,19,32,
210,255,169,18,32
200 DATA 210,255,160,0,132,180
,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
1,34,298,8,72
220 DATA 165,176,73,255,133,17
6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
3,167,165,168,105
250 DATA 0,133,168,202,208,239
,240,282,165,167,69
260 DATA 168,72,41,15,168,185,
211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
85,211,3,32,210
280 DATA 255,162,31,189,227,3,
149,199,202,16,248
290 DATA 169,146,32,210,255,76
,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
116,117,151,128,129,167,136
,137

```

Program 4: Apple Proofreader

By Tim Victor, Editorial Programmer

```

10 C = 0: FOR I = 768 TO 76B +
68: READ A:C = C + A: POKE I
,A: NEXT
20 IF C < > 7258 THEN PRINT "ER
OR IN PROOFREADER DATA STAT
EMENTS": END
30 IF PEEK (190 > 256) < > 76 T
HEN POKE 56,0: POKE 57,3: CA
LL 1002: GOTO 50
40 PRINT CHR$(4):"INWAS$00"
50 POKE 34,0: HOME : POKE 34,1:
VTAB 2: PRINT "PROOFREADER
INSTALLED"
60 NEW
100 DATA 216,32,27,253,201,141
110 DATA 208,69,138,72,169,0
120 DATA 72,189,255,1,201,160
130 DATA 249,8,104,10,125,255
140 DATA 1,195,0,72,202,208
150 DATA 238,164,170,41,15,9
160 DATA 48,201,58,144,2,233
170 DATA 57,141,1,4,13B,74
180 DATA 74,74,74,41,15,9
190 DATA 48,201,58,144,2,233
200 DATA 57,141,0,4,104,170
210 DATA 169,141,96

```

COMPUTE's Author Guide

Most of the following suggestions serve to improve the speed and accuracy of publication. COMPUTE! is primarily interested in new and timely articles on the Commodore 64/128, Atari, Apple, IBM PC/PCjr, Amiga, and Atari ST. We are much more concerned with the content of an article than with its style, but articles should be clear and well-explained.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one make of computer, please state the brand name and, if applicable, the BASIC or ROM or DOS version(s) involved. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be added at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we also appreciate a copy of the text file on the tape or disk. Please use high-quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name, the title of the article, and, if applicable, the BASIC/ROM/DOS version(s). Atari tapes should specify whether they are to be LOADED or ENTERed. We prefer to receive Apple programs on disk rather than tape. Tapes are fairly sturdy, but disks need to be enclosed within plastic or

cardboard mailers (available at photography, stationery, or computer supply stores).

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, TAB, ESC, SHIFT), BASIC words (LIST, RND, GOTO), and three languages (BASIC, APL, PILOT). Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length—from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5×7 black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. COMPUTE! pays between \$70 and \$800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (Editorial Department, COMPUTE! Magazine, P.O. Box 5406, Greensboro, NC 27403) it will take from four to eight weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing, "Revision" on the envelope and the article.

17. COMPUTE! does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact the Review Coordinator for details.

MLX Machine Language Entry Program For Commodore 64

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows you to enter machine language program listings without error. MLX is required to enter all Commodore 64 machine language programs published in COMPUTE!.

Type in and save some copies of MLX (you'll want to use it to enter future ML programs from COMPUTE!, COMPUTE!'s GAZETTE, and COMPUTE! books). When you're ready to enter an ML program, load and run MLX. You'll be asked for a starting address and an ending address. These addresses should appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0-9 and the letters A-F. But don't worry— even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. The data you enter with MLX is kept in a special reserved area of memory; clearing this workspace fills the reserved area with zeros, which makes it easier to find where you left off typing if you enter the listing in several sessions. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, there's no point in clearing the workspace, since the data you load in will fill the area with whatever values were in workspace memory at the time of the last Save.

At this point, functions menu will appear. If you're just starting to type in a program, pick the first option, ENTER DATA, by pressing the E key. You'll be asked for an address; type the four-digit number at the start of the first line of the program listing. If you've already typed in part of a program, be sure to load the partially completed program before you resume entry, then choose the ENTER DATA option and type the line number where you left off typing at the end of the previous session. In any

case, make sure the address you enter corresponds to the address of a line in the listing. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You do not type spaces between the columns; MLX automatically inserts these for you. You do not press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0-9 and the letters A-F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the

proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and

get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should not be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT address, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the

menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD "filename",8 for disk or LOAD "filename" for tape, and then RUN. Such programs will usually have a starting address of 0801. Other programs must be reloaded to specific addresses with a command such as LOAD "filename",8,1 for disk or LOAD "filename",1,1 for tape, then started with a SYS to a particular memory address. The most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type MLX, and then test your copy thoroughly before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in MLX cost you several nights of hard work.

MLX

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing in Programs" in this issue of COMPUTE!.

```
EK 100 POKE 56,50:CLR:DIM IN$,I,J,A,B$,S,B,(T),NS
DM 110 C4=48:C6=16:C7=7:Z2=2:Z4=254:Z5=255:Z6=256:Z7=127
CJ 120 FA=PEEK(45)+Z6*PEEK(46):HS="#0123456789ABCDEF"
SB 130 RS=CHR$(13):LS="LEFT":$S="":D$=CHR$(28):Z$=CHR$(8):T$="13 RIGHT"
CQ 140 SD=54272:FOR I=SD TO SD+23:POKE I,0:NEXT:POKE [SPACE]SD+24,15:POKE 78,B,52
FC 150 PRINT "[CLR]"CHR$(142)CH$:(8):POKE 532B0,15:POKE
```

```
E 532B1,15
EJ 160 PRINT TS" [RED][RVS]
[2 SPACES]E8 @3
[2 SPACES]"SFC"(28)"
[2 SPACES][OFF][BLU] ML
X II [RED][RVS]
[2 SPACES]"SPC"(28)"
[12 SPACES][BLU]"
PR 170 PRINT "[3 DOWN]
[3 SPACES]COMPUTE!'S MA
CHINE LANGUAGE EDITOR
[3 DOWN]"
JB 1B0 PRINT "[BLK]STARTING ADD
RESS@4";:GOSUB1030:IF A
D:GOSUB1040:IF F THEN1B
0
GF 190 PRINT "[BLK][2 SPACES]EN
DING ADDRESS@4";:GOSUB
300:EA=AD:GOSUB1030:IF
[SPACE]F THEN190
KR 200 INPUT "[3 DOWN][BLK]CLEA
R WORKSPACE [Y/N]@4";:A
$;IF LEFTS(A,$1)<>"Y"TH
EN220
PG 210 PRINT "[2 DOWN][BLU]WORK
ING...";:FOR I=BS TO BS+
EA-SA-7:POKE I,0:NEXT:P
PRINT "DONE"
DR 220 PRINTTAB(10)[2 DOWN]
[BLK][RVS] MLX COMMAND
[SPACE][MENU [DOWN]@4];
PRINT TS" [RVS]E[OFF]NTE
R DATA"
BD 230 PRINT TS" [RVS]D[OFF]ISP
LAT DATA":PRINT TS"
[RVS]L[OFF]OD FILE"
JS 240 PRINT TS" [RVS]S[OFF]AVE
FILE":PRINT TS" [RVS]Q
[OFF]UIT[2 DOWN][BLK]"
JH 250 GET A$:IF A$=NS THEN250
HK 260 A#=FOR I=1 TO 5:IF A$=
MIDS("ED$LL$","I,1):THEN A
=I:I=5
FD 270 NEXT:ON A GOTO40,610,6
90,700,2B0:GOSUB1060:GO
TO250
EJ 280 PRINT "[RVS] QUIT ":"INPU
T "[DOWN]@4";AS:IF LEFTS(AS,
1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 INS=NS:AD=0:INPUTINS:IF
LEN(IN$)>4THENRETURN
KF 310 B$=INS:GOSUB320:AD=A:B$=
MIDS(H$,3):GOSUB220:A
=D#AD*256+A:RETURN
PP 320 A#=FOR J=1 TO 2:A$=MID
$(B$,J,1):B$=ASC(A$)-C4+
(AS%"0")*C7:A$=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MIDS(
H$,B+1,1):B$=B*B*C6:PRI
NT MIDS(H$,B+1,1):RETU
RN
RR 360 A=INT(AD/26):GOSUB350:A
=AD*A#26:GOSUB350:PRINT
":"
BE 370 CK=INT(AD/26):CK=AD-Z4*
CK*5:(CK-Z7):GOTO390
PX 380 CK=CK*22+25*(CK-Z7)+A
JC 390 CK=CK*25*(CK-Z7):RETURN
QS 400 PRINT "[DOWN]STARTING AT
@4";:GOSUB300:IF IN$<>
NS THEN GOSUB1030:IF F
[SPACE]THEN400
EX 410 RETURN
HD 420 PRINT "[RVS] ENTER DATA
[SPACE]":GOSUB400:IF IN
$=NS THEN220
```

```

JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
    THEN PRINT INS:$PRINT"
    [UP][5 RIGHT]";
GC 450 FOR I=0 TO 24 STEP 3:BS
    =SS:$FOR J=1 TO 2:IF F T
    HEN BS=$MID$(INS,I+J,1);
HA 460 PRINT"[RVS]":BS$LS:$IF I<
    24THEN PRINT"[OFF]";
HD 470 GET AS:IF AS=NS THEN470
FK 480 IF(AS$"/"ANDAS$<":")JOR(A
    AS$"/"ANDAS$<"G")THEN540
MP 490 IF AS=R$ AND((I=0)AND(J
    =1)OR F)THEIR PRINT BS$:
    J=2:NEXT:I=24:GOT050
KC 500 IX AS$="[HOME]" THEN PRI
    NT BS:J=2:NEXT:I=24:NEX
    T:F=0:GOTO440
MX 510 IF(AS$=[RIGHT$])ANDF TH
    ENPRINT B$LS$:$GOT0540
GK 520 IX AS$<>LS$ AND AS$<>DS OR
    ((I=0)AND(J=1))THEN GOS
    UBL060:GOT0470
HG 530 AS$=LS$+SS$+LS$:$PRINT B$LS$:
    J=2-J:IF J THEN PRINT
    [SPACE]LS$:$I=I-3
QS 540 PRINT AS:$NEXT J:PRINT
    [SPACE]SS$:
PM 550 NEXT I:PRINT PRINT"[UP]
    [5 RIGHT]":INPUT#,INS
    :IF INS=NS THEN CLOSE3:
    GOT0220
QC 560 FOR I=1 TO 25 STEP3:BS=
    MID$(INS,I):GOSUB320:IF
    I<25 THEN GOSUB380:A(I
    /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
    B1060:PRINT "[BLK] [RVS]
    [SPACE]ERROR: REENTER L
    INE $4$":F=1:GOTO440
HJ 580 GOSUB1080:BS=BS+AD-SA:FO
    R I=0 TO 7:POKE B+I,A(I
    ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
    LOSE3:PRINT "[DOWN][BLU]
    ** END OF ENTRY **[BLK]
    [2 DOWN]":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT "[CLR] [DOWN] [RVS]
    [SPACE]DISPLAY DATA":G
    OSUB480:IF INS=NS THEN2
    20
RJ 620 PRINT "[DOWN][BLU]PRESS:
    [RVS] [SPACE][OFF] TO PAU
    SE, [RVS] RETURN[OFF] TO
    BREAK$4$[DOWN]"
KS 630 GOSUB1060:BS=BS+AD-SA:FOR
    I=BTB B7+:A=PEEK(I):GOS
    UB350:GOSUB380:PRINT SS
    ;
CC 640 NEXT:PRINT "[RVS]":A=CK
    :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
    ENPRINT "[DOWN][BLU]** E
    ND OF DATA **":GOT0220
KC 660 GET AS:IF AS=R$ THEN GO
    SUB1080:GOT0220
EQ 670 IX AS=SS THEN F=F+1:GOS
    UB1080
AD 680 QNFGOTO630,660,630
CM 690 PRINT "[DOWN][RVS] LOAD
    [SPACE]DATA":OP=1:GOTO
    710
PC 700 PRINT "[DOWN][RVS] SAVE
    [SPACE]FILE":OP=0
RX 710 IX=NS:INPUT "[DOWN] FILE
    NAME$4$":INS:IF INS=NS
    [SPACE]THEN220
PR 720 F=0:PRINT "[DOWN][BLK]
    [RVS]T[OFF]APE OR [RVS]
    D[OFF]ISK: $4$";

```

```

FP 730 GET AS:IF AS$="T"THEN PR
    INT "T[DOWN]":GOT0880
HQ 740 IF AS$>"D"THEN730
HH 750 PRINT "[D DOWN]":OPEN15,8
    ,15,"I0":B=EA-SA:INS$=
    $:+INS$ IF O THEN810
SQ 760 OPEN 1,B,B,INS$+,P,W":G
    OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
    H*256):PRINT#1,CHR$(AL)
    :CHRS(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
    RS(PEEK(BS+I)):IF ST T
    HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
    0940
GS 800 GOSUB1060:PRINT "[DOWN]
    [BLK]ERROR DURING SAVE:
    $4$":GOSUB860:GOT0220
MA 810 OPEN 1,8,8,INS$+,P,R":G
    OSUB860:IF A THEN220
GE 820 GET#1,AS,B:AD=ASC(AS+Z
    $)+256*ASC(B$+Z$):IF AD
    <> SA THEN F=1:GOT0850
RX 830 FOR I=0 TO B:GET#1,A:$P
    OKE BS+1,ASC(AS+Z$):IF(
    I>>B)AND ST THEN F=2:AD
    =I:I=B
FA 840 NEXT:IF ST>>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F>
    0)+1 GOTO960,970
SA 860 INPUT#15,A,$:IF A THEN
    CLOSE1:CLOSE15:GOSUB10
    60:PRINT "[RVS]ERROR: "A
    $:GOT0850
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
    187,PEEK(FA+3):POKE188,
    PEAK(FA+4):IFOP=0THEN92
    0
HJ 890 SYS 63466:IF(PEEK(7B3)A
    ND1)THEN GOSUB1060:PRIN
    T "[DOWN] [RVS] FILE NOT
    [SPACE]FOUND":GOT0690
CS 900 AD=PEEK(829)+256*PEEK(8
    30):IF AD>SA THEN F=1:
    GOT0970
SC 910 A=PEEK(831)+256*PEEK(83
    2)-1:F=F-2*(A>EA)-3*(A>
    EA):AD=A-AD:GOT0930
KM 920 A=B:EA+1:GOSUB1010:P
    OKE780,3:SYS 63338
JF 930 A=BS:BS+(EA-SA)+1:GOS
    UB1010:ON OP GOTO950:SY
    S 63591
AE 940 GOSUB1080:PRINT "[BLU]**
    SAVE COMPLETED **":GOT
    0220
XP 950 POKE147,0:SYS 63562:IF
    [SPACE]ST 0 THEN970
FR 960 GOSUB10B0:PRINT "[BLU]**
    LOAD COMPLETED **":GOT
    0220
DP 970 GOSUB1060:PRINT "[BLK]
    [RVS]ERROR DURING LOAD:
    [DOWN]$4$":ON F GOSUB9B
    0,990,1000:GOT0220
PP 980 PRINT "INCORRECT STARTIN
    G ADDRESS":":GOSUB360:
    PRINT":":RETURN
GR 990 PRINT "LOAD ENDED AT ":":
    AD=SA+AD:GOSUB360:PRINT
    DS:$:RETURN
FD 1000 PRINT "TRUNCATED AT END
    ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
    *256):POKE193,AL:POKE1
    94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
    *256):POKE174,AL:POKE1
    75,AH:RETURN

```

```

FX 1030 IF AD>SA OR AD>EA THEN
    1050
HA 1040 IF(AD>511 AND AD<40960
    )OR(AD>49151 AND AD<53
    24B)THEN GOSUB1080:F=0
    :RETURN
HC 1050 GOSUB1060:PRINT "[RVS]
    [SPACE]INVALID ADDRESS
    [DOWN][BLK]":F=1:RETU
    RN
AR 1060 POKE SD+5,31:POKE SD+6
    ,208:POKE SD,240:POKE
    [SPACE]SD+1,4:POKE SD+
    4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
    TO1090
PF 1080 POKE SD+5,B:POKE SD+6,
    240:POKE SD,0:POKE SD+
    1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
    KE SD+4,0:POKE SD,0:PO
    KE SD+1,0:RETURN

```

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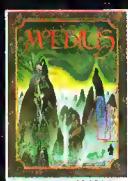


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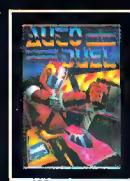
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